PATENT
Docket No. FBR06132P0010US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	)	A Distributed Stereo System
Leonard Colin Andrews	)	Group Art Unit: 2644
Serial No.: 09/485,657	)	Examiner: Justin I. Michalski
Filed: March 24, 2000	)	

DECLARATION UNDER 37 CFR 1.132

Andrew Goldfinch declares as follows:

1. I am the proprietor of LeisureTech Electronics Pty Ltd, the assignee of the above-referenced United States patent application.

2. The system referred to herein as A-BUS is a distributed stereo audio system using a Category 5 four pair twisted cable to carry at least audio signals and system power from a power supply and source in one room to amplifiers and speakers in another room. The audio signal is carried on two of the pairs of the cable and power ~~is carried on a third pair~~ DATA + STATUS IS CARRIED ON THE THIRD + FOURTH PAIRS. ~~The fourth pair can be used for data and status signals~~. The attached brochure, entitled "A-BUS Multi-Room Audio Simple Solutions, Create Big Markets", describes the system.

3. The inventor, Leonard Andrews, has a 45 year history in electronics engineering in the audio industry and he has been with LeisureTech Electronics since 1989. I have been in the electronics industry for 38 years, starting in the emerging Hi-Fi market in the mid sixties. I founded LeisureTech Electronics in 1977. In 1991 Len and I decided to look at making products to suit Australian requirements and to protect the company from the fluctuations in the Australian dollar. These products, sold under the Andrew's Audio brand, were well received by our dealers and we received a number of industry awards for them. Today 50% of LeisureTech's sales in Australia are Australian made products developed by Len Andrews and myself.

4. In 1991 one of our first considerations was to develop a system that eliminated the many weaknesses of traditional distributed audio systems. One of the biggest weaknesses was the losses in long runs of speaker cables from the source components to the speakers in remote rooms. We also did not like the sonic losses that came from autoformer volume controls and impedance matching devices and we were keen to locate the amplifiers as close to the speakers as possible. Despite several attempts at configuring a solution we were limited by cost factors and a number of practical issues. One of the major reasons that manufacturers had not tried to localize the amplification in individual rooms was the difficulty in finding a convenient place to install a bulky amplifier in each room and gain access to AC power which is normally at floor level while the speakers are normally mounted high on the wall or in the ceiling.

5. Our solution was to centralize the power supply to reduce the system cost as one power supply could power multiple amplifiers which would be more compact. In practical terms this did not work as the current drain of the discrete amplifiers we were using at the time was too high and there was no simple cabling method so the project lapsed.

6. When we became aware of category 5 cable, with its eight cores twisted into pairs, it looked to be a solution. We were immediately rebuked for lack of understanding. The twisted pairs did not look like the traditional shielded cables used in the audio industry and the cable was believed too light to carry enough power to power an amplifier.

7. From my experience I was aware that traditional beliefs over power requirements were misplaced, particularly in the US. It was also my belief that if we could deliver high quality line level audio to each room and eliminate the losses which occurred with long cable runs, less volume level would be required. Despite believing the concept would not deliver enough power and having concerns about problems of induced noise, Len Andrews set about developing our concept around category 5 cable. He produced a power module that was small enough to fit in light switch housing or on the back of an In-Wall speaker and he

eliminated interference problems. These innovations immediately made the concept we were aiming at from the beginning work. The sound quality of the initial unit was not good and the output was limited. But after considerable research Len came up with ample power output for most multi-room requirements and the quality of sound delivered was excellent, well above the traditional speaker level distribution methods. We ended up with a system that delivered huge advantages to system designers, installers and consumers that was delightfully simple in all aspects.

8. The true inventiveness of this system is demonstrated by the advantages that it provides in all areas of distributed audio, in greatly simplifying the whole process.

Only one cable is required to each room.

The quality of sound in traditionally amplified systems is directly related to the quality of cable used (its gauge and insulation) which can not only be costly but also very bulky. If remote control data is required, a separate cable has to be run and often a infrared system has to be installed. A-BUS transmits audio, system power, data and status in one category 5 cable. A cable that has a low profile, a damage resistant outer sheath, is commonly used by installers, has good termination connecters available and is low cost. Most installers have carried out category 5 training and are proficient in installing the product. There are good quality punchdown and RJ-45 connectors commonly available for terminations.

Simple design

A-BUS systems are simple to design, education in audio parameters is not required. Impedance matching is not required. Cable quality is not an issue and data transmission is not an issue as it is built in. Components are connected in a plug and play manner.

Simple Installation

The cost of pre-wiring a home is cheaper and easier. The category 5 cable which installers already have in their trucks is low cost and easy to install. Caution is not required as

A-BUS is not susceptible to interference when run past other electrical items in the house. The installers also carry termination tools that make installations of A-BUS component very efficient.

Flexibility

Once a house is wired for A-BUS a variety of components to suit individual applications around the house can be selected and they can be easily changed and upgraded. Sophisticated traditional systems are normally supplied in a standard package with little flexibility so that a minor room would require the same expensive keypad as the more important rooms. After a standard A-BUS pre-wire, the home owner can still make choices as to the quality of sound they require in each room and the flexibility. For instance; a single source A-BUS system can become a multi-source system simply by changing the hub.

New Markets

The simplicity and flexibility of the system has opened up many new opportunities to the fast growing distributed audio market which is continually short of competent system designers and installers. With A-BUS, a specialist installer is not required to pre-wire a home and the electricians already on site can carry out the installation greatly reducing costs.

9. While these advantages are now well proved in the market and A-BUS has become a worldwide success, getting the technology off the ground was extremely difficult, especially in the US. We had always seen the US as a major market with clear applications for our product. However, when we took A-BUS to the US we had great difficulty in getting anyone to take it seriously. Despite the fact that we were well known to the companies there who should have been most interested in our technology - they looked at it as a "toy" and most qualified industry engineers simply said it was impossible, one even told me that it was simply a matter of physics and while one president of a major "In Wall" speaker manufacturer was keen to take the technology on, his staff would not entertain it and this prevented him proceeding.

10. It was with some in trepidation that we filed an International Patent

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application to extend the filing deadline in the US by a further 18 months. At the time we were very disheartened with no sign of success. In an attempt to overcome the scepticism in the US market we introduced the slogan, "Have you heard it?" and did everything possible to keep the low power output a secret.

11. It was not until I met the new CEO of Russound, who had no technical background, that progress was made. He was concerned that A-BUS could be a possible threat to his large autoformer volume control business. He visited Australia on a sales trip and we were able to give him a good demonstration of A-BUS and show its full potential.

12. Before Russound signed its licensing contract with LeisureTech Electronics they insisted on getting an independent opinion on our patent application. This has also been done by many of our licensees before entering into their license agreements with us. None have come to us with a negative opinion from their patent attorneys.

13. Products made utilising our A-BUS technology were first released in the US in January 2000 at the CES (Consumer Electronics Show) in Las Vegas, over two years after their release in Australia. It was an instant success. It received its first of two Innovation Awards (2001 - 2002). Russound was able to demonstrate the product at the show revealing its qualities in an open noisy environment and proved that A-BUS could produce enough power, but many engineers still continued to consider the technology a 'toy' and system designers saw its simplicity as a threat to their businesses.

14. Russound's introduction of A-BUS products had a major impact in the US market and attracted the interest of people thoughout the industry and the press who have recognized its inventiveness. Many reviews and commentaries have been published. Subsequently we have received regular editorial and reviews. A good examples is a review by Bant Butterworth, attached, editor of the Robb Report's Home Entertainment magazine. He has now installed A-BUS in two of his homes. "Despite resistance in some areas Russound's

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introduction did attract ... Part of this systems magic is that it does not require racks of amplifiers and switchers. The keypad's contain amplifiers and the hub – the "brain" of the system – is its tiny box that connects to the keypads through a single CAT5... I missed my first A-BUS system terribly when I recently moved, and I am so thankful to have the new one installed. I have tested more than 500 electronics products in my career, including astoundingly good speakers, amplifiers and surround-sound processors. No other, though has brought me as much joy...".

15. A-BUS products manufactured by licensees in the US have now received most awards presented in the industry by industry associations and magazines. The attached brochure, entitled "The Easy Way To Multi-Room Audio", shows some awards for A-BUS.

16. A-BUS has now developed into an industry wide format with manufacturers from all areas of the industry adopting it. Companies such as Harman/Kardon and Onkyo Integra now have A-BUS/ready output sockets on their amplifiers. The A-BUS sockets on the back of their amplifiers replace the traditional Speakers 'B' facility with the flexibility of built in remote control and the same RJ-45 socket can interface with any A-BUS hub to expand the connection to as many rooms as required without effecting the main speakers. See the attached article from the January/February 2003 issue of Custom/Retailer, entitled "Is the ABus Going Your Way?".

17. A newer market sector, the structured wiring market, is providing a much needed service to the new home market organizing the many technologies being installed into homes these days. Telephone, video, data and now audio distribution are often centralized into one panel. In 2004 it is expected that 60% of new homes will have structured wiring panels installed. A-BUS has now become an industry standard in this market with most suppliers of structured wiring panels offering an A-BUS audio solution. Here again A-BUS simplicity and the use of category 5 cable is important. Installers are required to be proficient in a number of technologies (telephone, data, video, security, etc.). A-BUS uses the same cable they use in

other technologies, the quality of sound is not affected by the longer cable runs needed for structured wiring and it is easy to design and installs a high quality distributed audio system without necessarily requiring an audio engineer.

18. To date we have held back the introduction of A-BUS/direct our speaker technology where the power module is fitted directly onto the speaker/s. It is now in the process of introduction and we expect that five companies will introduce this technology in 2005.

19. Currently LeisureTech has signed over 30 Non Disclosure Agreements with companies interested in A-BUS technology. 15 of these companies are now shipping A-BUS product with several more working to introduce product in 2005. Some of these companies are major companies some are small, most importantly they represent all areas of the industry which is a good indication that A-BUS is now an accepted format in the audio industry and is an original and inventive technology. The current list of A-BUS licensees includes the following corporations: Russound FMP Inc.; Harman International Industries Inc; Onkyo Japan Corporation; OnQ Technologies Inc.; Channel Vision; Audio partnership plc; ~~FutureSmart~~; Honeywell Security Division; United Speakers; US Tech; Home Director Inc; Tyco Electronics Corporation; and Jamo A/S.

20. A-BUS Sales Revenues. The following figures represent the approximate aggregate of sales revenues in US$ of A-BUS (stand alone) and A-BUS (enhanced/ ready/ capable) product sold in the United States market place either manufactured by A-BUS Licensees or sold direct into the US market by LeisureTech Electronics Pty Ltd for the years ended 30 June 2000, 2001, 2002, 2003, 2004.

Year end date	Revenues
06/30/00	$0
06/30/01	>$1,000,000

06/30/02	>$3,000,000
06/30/03	>$37,000,000
06/30/04	>$47,000,000

20. Finally, it is important to note that, no-one had come up with our concept before its release in the US and it was some time before there emerged some "A-BUS-like products" on the market. The impact on the market cannot be underestimated and demonstrates that this distributed audio technology is original and inventive.

All statements which I have made in this Declaration of my own knowledge are true, and all statements which I have made in this Declaration on information and belief are believed to be true. I have also been warned that willful false statements and the like are punishable by fine or imprisonment, or both under §1001 of Title 18 of the United States Code and may jeopardize the validity of this application or any patent issuing thereon.

Date: 26-Nov 2004

Andrew Goldfinch

A-BUS

Multi-Room Audio

Simple Solutions, Create Big Markets

A-BUS

Multi-Room Audio

Simple Solutions, Create Big Markets

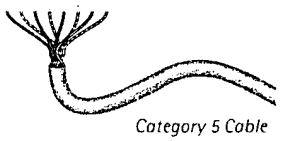
A-BUS TECHNOLOGY

The Story Behind A-BUS

A-BUS was developed by Australia's leading supplier of multi-room audio products, LeisureTech Electronics. With 35 years experience in the industry they found the traditional methods of audio distribution were fundamentally wrong - long lengths of speaker wire from a central amplifier to speakers far away just didn't make sense. The resultant solution is their patent-pending A-BUS technology, which is fast becoming the industry format for the future of Distributed Audio.

What is A-BUS

A-BUS is a simple solution for Multi-Room Audio that uses a single Category 5 cable to carry audio signal, infrared data, system power and system status to a power module in each room. High quality audio is delivered to each room without signal loss and each pair of speakers has their own individual amplification with independent volume up and down. It is simple to install and use. A-BUS has already been adopted by manufacturers in most sectors of the audio market and it is already a standard platform for Audio Distribution in Structured Wiring for new homes.



Category 5 Cable
4 Twisted Pairs

Why is A-BUS Special

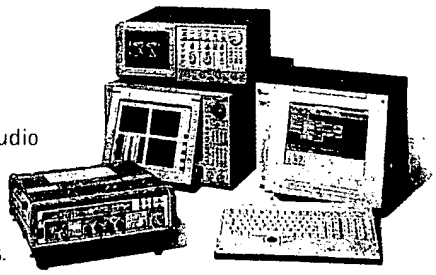
A-BUS has more than achieved the all goals set by its developers and as a result has become a very powerful industry standard. This A-BUS standard is seen as the catalyst to the transformation of the multi-room audio market from a specialist market to a consumer market which is likely to become one of the industries biggest growth areas in the next decade.

What is the Value of A-BUS as the Industry Standard?

Manufacturers from all areas of the audio market can expect real compatibility in multi-room audio. This gives consumers a clearer message and the entire industry benefits - builders, developers, dealers and installers. The simplicity of A-BUS enables quick access to the rapidly developing markets in the home building industry.

A-BUS™ The A-BUS trademark is another valuable asset. All A-BUS - approved products carry the A-BUS logo. Consumers know that equipment bearing the A-BUS logo is multi-room capable. They also know it will be instantly compatible with any other A-BUS product and sound great.

Doing Business with A-BUS



Leisuretech Electronics is fully equipped to supply manufacturers with OEM A-BUS components providing fast and easy access to the growing market for multi-room audio with proven products. Under close supervision from LEISURETECH'S new facility in Sydney Australia, all products are manufactured to our strict QC standards and Bill of Material requirements. The new Leisuretech facility is fully equipped with R & D, Engineering, Testing, Quality Control and Marketing Support capabilities.

A-BUS Standards

All A-BUS licensed products must comply with LeisureTech's published Product Standards. All manufacturers wishing to sell products bearing the A-BUS logo must submit their products for approval prior to their introduction.

A-BUS - The Solution

The Solution when simplicity and functionality matters.

Consumers and suppliers are looking for uncomplicated multi-room audio. A-BUS technology removes confusion from the equation, creating fewer obstacles, more benefits, dependable performance and a profitable business structure. A-BUS opens the door for Distributed Audio to grow from a specialist business to a broad-based consumer business.

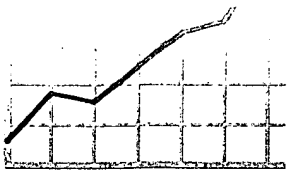
Favorable Lifestyle Conditions

Today's consumer wants home entertainment in more than just one room - kitchens, bedrooms, studies, workshops and bathrooms are now essential entertainment areas too. They don't want ugly black boxes and messy cables to interfere with their decor. They do want an integrated, invisible solution that is simple and easy for everyone in the household to use.

A-BUS also helps out where space for the home theater system is often limited. A-BUS Distributed Audio can be simply an RJ-45 socket on the wall. In structured wiring panels, A-BUS hubs are compact and functional and the number of zones is expandable via the 4-way hubs' expansion ports. Combined with A-BUS/ready amplifiers, it is simply expandable by adding additional hubs and power supplies.

Category 5-based A-BUS Opens the Door

A-BUS' use of Category 5 cable is ideal for Structured Wiring because it is familiar to everyone and inexpensive. It makes it easier for installers from other disciplines to be easily trained for A-BUS installation. The lower cost of wiring for A-BUS means more rooms will be wired for audio - creating homes with higher perceived value and more business opportunities for distributed audio systems.



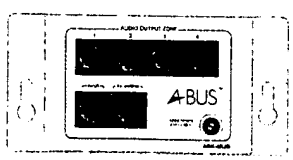
A-BUS - structured wiring - the Gateway to the future.

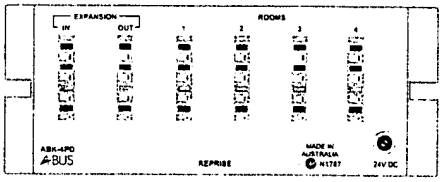
Structured Wiring is the much needed solution to the growing consumer demand for homes that can provide a better lifestyle. Along with the demand for better phone systems, broadband access, security, lighting and system integration comes the desire to have multi-room audio. To provide these solutions economically, manufacturers in each field have had to create packaged products that are easy to specify and that can be reliably installed by local installers. A-BUS simplicity fulfills all these requirements, and as a result, it has been quickly adopted by most structured wiring manufacturers.

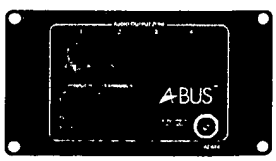
The question is - what is the market potential for audio in this environment? Recent studies show custom-installed audio in new homes to be about 10% while structured wiring panels have come from under 5% percent 5 years ago to an expected 50% in 2004.

In 2004, products will be shipped by at least seven leading brands in the Structured Wiring industry. Their commitment to A-BUS has created an industry standard for audio distribution that gives builders, system designers, installers and new home owners clear wiring guidelines for their audio requirements. It all adds up to a prescription for healthy sales growth for multi-room audio and A-BUS. A-BUS will enable the custom market to develop even greater potential.

A-BUS offers a variety of distribution hubs ideal for the Structured Wiring industry.



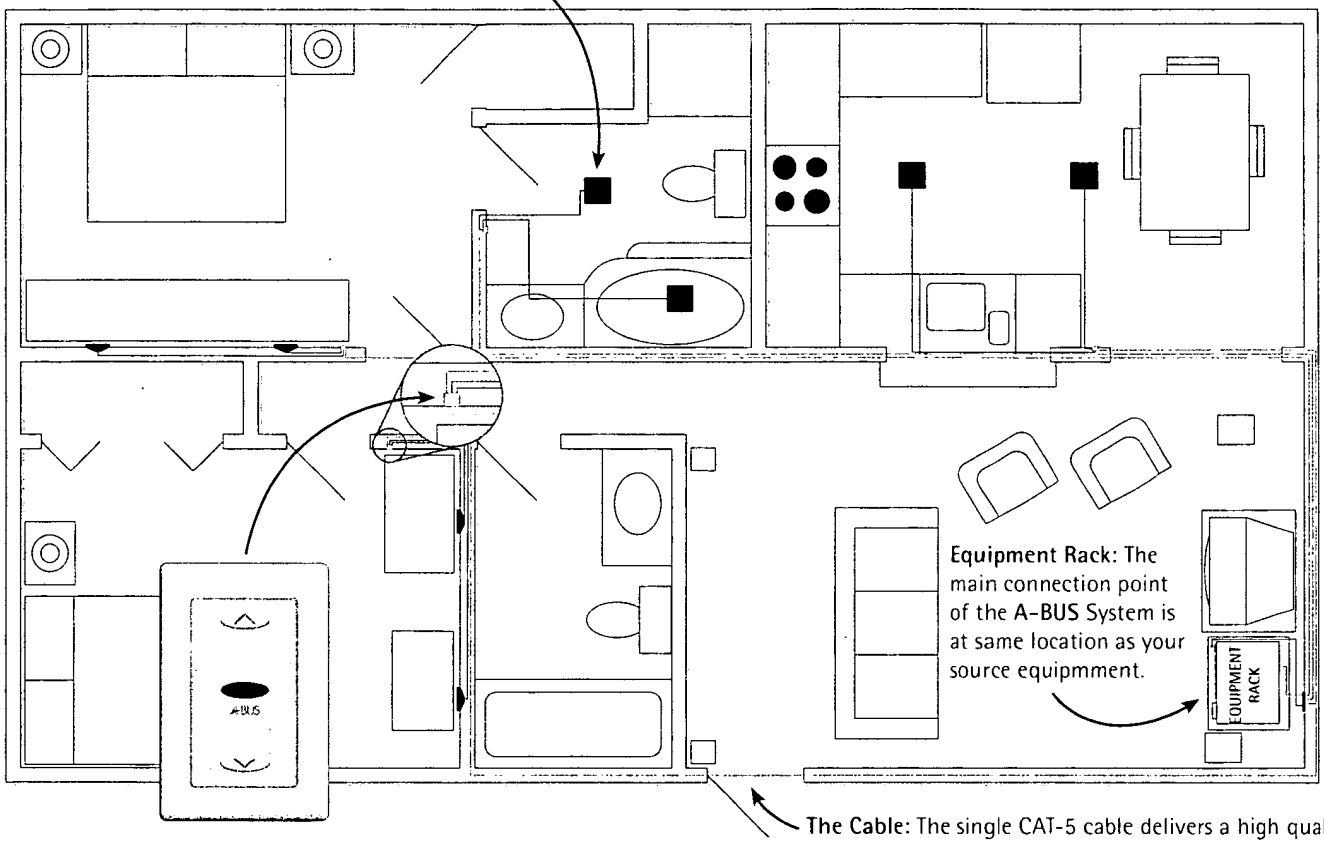




What Makes Up an A-BUS System?

The following diagram explains the typical structure and key components that make up an A-BUS system:

Speakers: The system will work with any normal in-wall/ceiling and traditional box loudspeakers. However, the in-wall or in-ceiling variety is recommended – with a sensitivity rating of 88 dB or better and an impedance between 4 and 8 ohms.

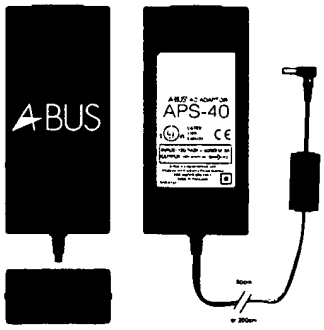


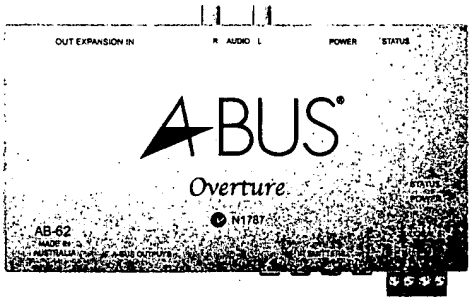
Equipment Rack: The main connection point of the A-BUS System is at same location as your source equipmment.

The Cable: The single CAT-5 cable delivers a high quality audio signal without losing signal quality. It supplies system power that is centralized while also supplying data (infrared commands) and system status.

The A-BUS Module: The A-BUS module is in place of the traditional volume control (attenuator) with a power module (amplifier). The size is similar, and fits into a standard single-gang electrical switch housing (J-Box). An A-BUS power module may also be connected directly to the speakers.

At the equipment rack - the hub





The Hub: At the core of the system is the A-BUS hub, located near the main system amplifier or in a structured wiring panel to distribute audio signal, system power (power supply) and status to each power module. Custom hubs also distribute infrared data to the source components. In structured wiring environments, if the amplifier is not A-BUS/***ready***, an Interface Module is required near the amplifier for audio source input and for infrared data output. Hubs generally distribute to four zones and multiple hubs may be used. They can be either single source or multi-source.

What sets A-BUS apart?

It is easier to see the uniqueness of the **A-BUS** and appreciate it's simplicity with a quick overview of where current systems fall short along with the obstacles to success that existed prior to **A-BUS**.

Area	Issue	How A-BUS solves it
Wiring	Speaker level signal distribution degrades signal quality and reduces power output	Distributing the signal at line level eliminates loss and improves sound quality
	Complex wiring requirements costs more to install	**A-BUS** uses one single CAT-5 cable that is easy to install and is lower in cost
	Separate cable required for Infrared data in addition to audio cable	The cable transmits audio signal, system power, infrared data and status without the need for multiple wires
	Quality and weight of speaker cable limits the ultimate sound quality	One simple CAT-5 cable will deliver consistently high performance to all locations
	Inefficient impedance matching required for single amplifier applications	Line level signal distribution eliminates this problem
Amplification	Central amplifier volume control affects sound level in every room	Main amplifier volume does not affect the volume control of the remote rooms
	Volume controls in remote rooms are stepped (6-12 steps) Therefore they can only reduce volume-not increase it!	**A-BUS** lets the user adjust volume both UP and DOWN (infinite adjustment possible)
Functionality	Music source often limited in remote rooms	**A-BUS** incorporates the flexibility to select a number of sources as well as the number of locations covered
Installation	Complex system designs requires advanced designers and engineers	Use of a single cable wiring system in a star pattern makes **A-BUS** easy to install and is also "future-proof"
	Upgrading system to multi-source etc. is difficult and expensive	**A-BUS** modules are all inter-compatible making upgrades a simple process at any time

Bottom Line - **A-BUS** eliminates all traditional multi-room problems. It also eliminates the signal losses that have often been overlooked. As a result, **A-BUS** delivers a high quality audio signal to every room. The power output (deliberately never quoted) is the system's biggest surprise. It delivers enough power for 99% of multi-room applications. In situations where very high power output is required a local power amplifier can be easily adapted, using standard **A-BUS** wiring.

HOME ENTERTAINMENT & DESIGN, Summer 2003

Article by Brent Butterworth - Editor

"This system is magic."

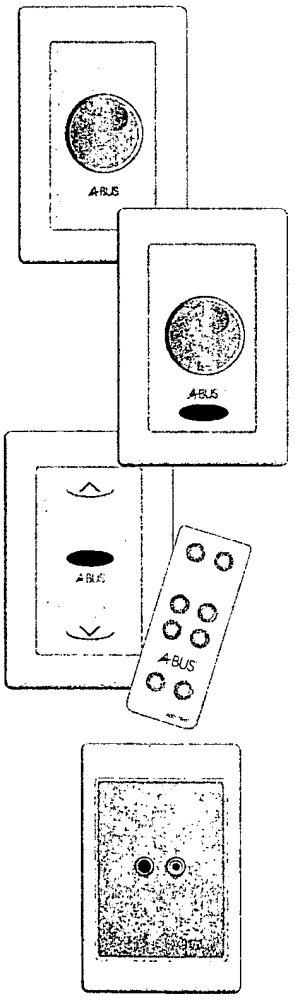
Brent said *"I am heartened to see whole house audio systems in so many luxury homes. Yet I notice some of those systems go largely unused".* Brent's reasoning *"any device more complicated than a toaster will frighten away nine-tenths of all people. Simplicity, when it comes to multi-room audio, is a vital factor. A-BUS is simplicity."* Brent continues, *"The logical extension of my theory is that whole-house audio systems should be as simple to operate as a toaster..."*

In Brent's overview, *"...it will be one of the most useful home improvements you can make because you will use it every day."* Brent's summarizes, *"I have tested more that 500 electronics products in my career, including astoundingly good speakers, amplifiers and surround-sound processors. No other, though, has brought me as much joy as this one."*

A-BUS Applications and Opportunities

A-BUS is an industry format that is available to manufacturers from all market sectors. LEISURETECH has a wide range of complementary products that readily integrate their individual multi-room audio products into a compatible standard. The A-BUS standard ensures compatibility. The A-BUS logo ensures consumer confidence.

The A-BUS technology platform can be applied to meet your marketing opportunities in many ways. Constant in any application is that fact that A-BUS always sounds great. Here are some of the A-BUS applications available to you.



A-BUS /*custom*

A-BUS/***custom*** products are targeted to the specialist market. Custom products are stand-alone products that can be integrated into a wide variety of applications, from standard components for basic systems to sophisticated components which can provide added facilities and flexibility. The A-BUS/***custom*** market is increasingly well established and has high growth potential. These products suit organizations involved in the custom audio market, as well as those looking to enter. The manufacturing of the components is easy and does not require expensive tooling.

A-BUS /*structured*

A-BUS has been recognized by the Structured Wiring industry as an excellent solution to their Distributed Audio needs as described in detail in other sections of this brochure. A-BUS distribution hubs can be readily adapted to fit specific Structured Wiring panel dimensions and functionality can be designed to meet specific needs. A-BUS provides a neat, simple solution that integrates beautifully with the rest of the Structured Wiring industry. The building industry sees A-BUS/***structured*** as an excellent tool to get multi-room audio into more homes, increasing the perceived value and attracting more buyers.

A-BUS /*direct*, A-BUS /*active*

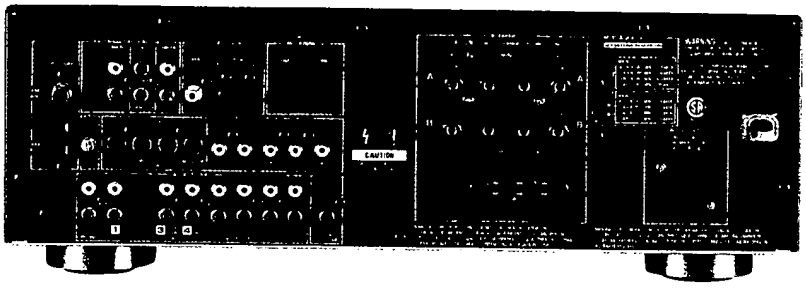
Installing the power module directly on the loudspeakers opens up many new and exciting opportunities and advantages.

Running the Category 5 cable directly to the speakers completely eliminates the weakest link in the system, the speaker cable itself. Many new opportunities are opened up for speaker designers. Drivers and crossovers can be specifically designed providing for better efficiency and sound quality. The direct wiring can simplify the installation process and make retrofit installations easier than ever.

A-BUS/***direct*** is a cost-effective solution where the power module is mounted on the back of the master speaker and includes the infrared receiver to receive control data. A-BUS/***direct*** is the ideal solution for owners of A-BUS/***ready*** amplifiers who wish to expand their system to an additional room. Only one Category 5 cable is needed between the speakers and the amplifier!

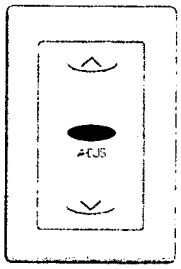
A-BUS/***active*** is an opportunity for performance based speaker manufacturers to develop loudspeakers with the sophistication that reflects their product quality and to achieve audiophile performance from "In Wall/Ceiling" loudspeakers. These companies will also be able to take advantage of the large number of new homes being pre-wired for A-BUS. A limited number of licenses will be issued for this technology.

A-BUS



A-BUS ready

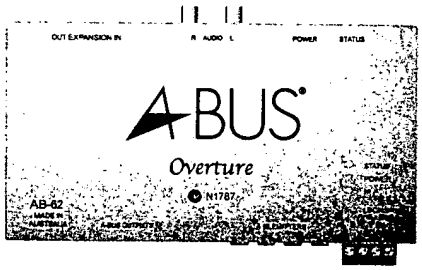
For many years A/B speaker selection has been a standard feature on components. **A-BUS/*ready*** is the catalyst for that to improve. Today's consumers want their receiver to be an entertainment source for the whole house. Distributed Audio is growing strongly and manufacturers need easy access to this growing market. **A-BUS/*ready*** implements easily, adds great value, and creates a house full of new selling opportunities.



A-BUS/*ready* is ideal for mainstream Hi-Fi manufacturers - by simply placing an RJ-45 socket on the back of amplifiers, and Hi-Fi Systems. The one socket handles all requirements - from a simple one room extension from Speakers 'B' to providing direct connection to the growing range of **A-BUS** components to suit nearly any application.

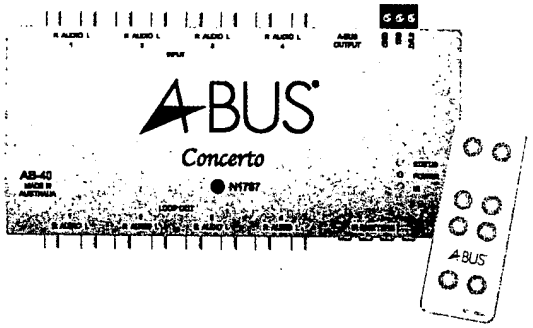
A-BUS/*ready* is a simple solution that gives consumers a variety of multi-room audio solutions.

A-BUS/*ready* and Speakers 'B' - Simply one cable extends the sound system to another room. Connection to any **A-BUS** power module gives individual volume up and down and full infrared remote control. **A-BUS/*ready*** is the smart way to replace Speakers B and makes great economic sense. The savings on the cost of parts associated with Speakers B and/or the volume control chip in a second zone output help offset the parts cost for adding **A-BUS/*ready***. As the consumer awareness of **A-BUS** grows, the consumer value of A-BUS/ready increases. And at the same time, the low cost and engineering simplicity of **A-BUS/*ready*** surprises most engineers. **A-BUS/*ready*** is like all other **A-BUS** formats - providing a simple solution that does its job extremely well.



A-BUS/*ready* and Full custom audio – The same RJ-45 socket is also compatible with any **A-BUS** hub - providing access to any number of additional rooms.

A-BUS/*ready* and Structured Wiring – With one Category 5 cable the same RJ-45 output will provide simple and space efficient integration to the growing number of homes with structured wiring systems that include **A-BUS** pre-wiring.



Safety Note: **A-BUS/*ready*** is IP safe. This means that no damage will occur, even if **A-BUS** is accidentally connected to an Ethernet jack.

A-BUS, the format of the future

A-BUS is the key to new growth opportunities for the future. Consider the integration of the three **A-BUS** technologies. **A-BUS/*ready*** amplifiers can power one or two extra rooms directly. A single Category-5 cable from the back of the amplifier to each room to connect to either an **A-BUS/custom** wall module or directly to an **A-BUS Active** in-wall speaker. For larger multi-room installations an **A-BUS/*ready*** amplifier can be connected to an **A-BUS** connecting block to suit most applications. **A-BUS** is a simple way to "plug and play."

Industry and Consumer Acceptance

Every one loves A-BUS - A-BUS has built a strong brand position and a positive reputation for dependability and quality. Reviewers love A-BUS. Installers like its simplicity and dependability. Dealers enjoy the design flexibility and value. Everyone is surprised that such a simple technology can deliver so much performance. A-BUS is a trouble-free format that is easy to design and install that takes the complication out of distributed audio.

Why Everyone Loves A-BUS

A-BUS has an unusual position in the market. Everyone loves it and there are good reasons why.

Simplicity.

A-BUS makes multi-room audio easy for everyone manufacturers, system designers installers and consumers.

Sound quality.

Yes, "have you heard it" is the real question, how can a technology so simple sound so good. Well the answer is just as simple. A-BUS eliminates the losses found in traditional distributed audio systems. With A-BUS you can be confident of a good result every time.

Flexibility.

When a home is pre-wired for A-BUS the new home owner can start with a simple system and have the opportunity to upgrade and expand the system in the future.

Compatable.

With the A-BUS standard consumers know that any product baring the A-BUS logo is A-BUS compatible wirth all other A-BUS products. It makes the choice of product quite simple.

A-BUS

Technology From

LeisureTech electronics

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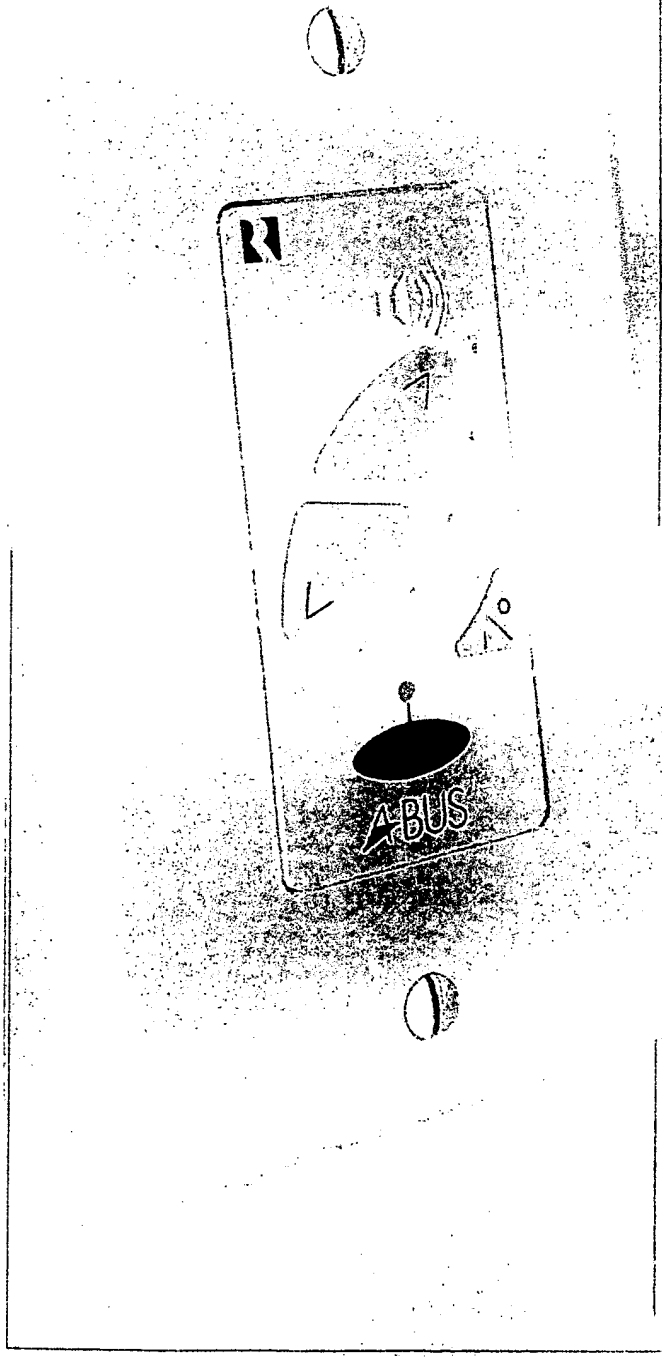
Australia
Tel: 61 2 9697 9888
Fax: 61 2 9697 2266
Email: a-bus@leisuretech.com.au

MUSIC BY MAGIC

AN UPGRADE LIFTS RUSSOUND'S A-BUS MULTIROOM AUDIO SYSTEM FROM SIMPLE TO SENSATIONAL.

BY BRENT BUTTERWORTH PHOTOGRAPHY BY JOHN PHILLIP



As a music lover, I am heartened to see whole-house audio systems in so many luxury homes. Yet I notice that some of those systems go largely unused. Why would anyone ignore a system that spreads music to every room of the house? I have a two-part theory. Part one: Most whole-house audio systems are controlled by wall-mounted keypads that cram eight to umpteen buttons into a space the size of a business card. Part two: Any device more complicated than a toaster will frighten away nine-tenths of all people.

The logical extension of my theory is that whole-house audio systems should be as simple to operate as toaster and Russound has done just that with its A-BUS multiroom audio system.

With the A-BUS system, you see only a keypad with three buttons. When guests notice the keypads on my walls and ask what they do, I tell them, "Punch a button and find out." In seconds, music envelops them.

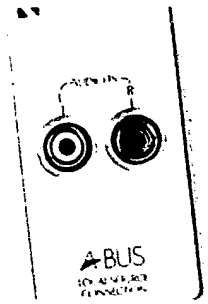
The original Russound A-BUS system was perhaps *too* simple. Through the keypad, it accessed only a single audio source, such as a CD player or AM/FM radio. One source is simply not enough. Who among us does not want to spice his or her CD listening with an occasional baseball game on AM radio (or vice versa)?

Russound's revised A-BUS system solves that problem without adding a single button. The old version offers buttons for on/off, volume up and volume down. With the new version, pushing the on/off button now cycles among up to four audio sources.

Holding this button down for a couple of seconds shuts off the sound for that specific room. Pressing the button again shuts off the sound in every room.

You have just read everything you need to know about operating the Russound A-BUS system.

A handheld remote controls the A-BUS system and all of the audio source devices connected to it; the remote will work in any room that contains a keypad. With this remote, I anxiously await the moment when my guests turn up their noses at my music



The A-LC2 input module (left) lets your installer add an extra CD player or other audio source device for any room. The tiny A-H484 hub (below) and its power supply are all the electronics the A-BUS system needs.

selection. I simply pick up the remote, press a button to change the CD selection, and revel as they look around in search of my audio components, which are hidden in a service closet several rooms away.

The A-LC2 accessory lets your installer add an extra CD player or other audio source device to any A-BUS-equipped room. It provides a stereo audio input and fits a Decora switchplate. You can use A-LC2s to add CD players in the guest bedroom and your kids' rooms so they can easily play music of their choosing; I use one to hook up a record player in my lounge. When the source connected to the A-LC2 begins playing, the keypad in that room automatically switches to that source.

While A-BUS is primitive compared with most multiroom audio systems, I find ways around its limitations. I regularly listen to three radio stations: two FM and one AM. With most multiroom systems, I can switch stations from the keypad. Obviously, I cannot accomplish this from the Russound system's three-button keypads. However, a solution comes to mind: I connect three radio tuners, set each one to a different favorite station, then use the on/off buttons on the keypads to select the different tuners. Presto—my favorite radio stations are now at my fingertips.

A computer also mates well with the Russound A-BUS system if you set the computer up for wireless control from a Pocket PC (see this month's "Editor's Note"). With the Pocket PC, I can select the music I want to hear from anywhere in my home, and the Russound A-BUS system lets me distribute music from the computer to each room.

Part of this system's magic is that it does not require racks of amplifiers and switchers. The keypads contain the amplifiers, and the hub—the "brain" of the system—is a tiny box that connects to the keypads through a single Cat-5 cable. A small AC adapter connects to the hub to provide power for the keypads.

The basic A-BUS kit supplies sound for up to four rooms, each with its own keypad. The A-H484 hub Russound supplies in the kit accommodates up to four more keypads (for a total of eight) with the addition of a second power supply. By adding more hubs and more power supplies, your instal-ler can expand the system to suit even large homes.

The significant limitation of A-BUS, however, is power—each keypad supplies only 7.5 watts per channel. You might be surprised, though, to discover how far 7.5 watts can go, because casual music listening normally consumes only a watt or two of power. I find the power adequate for every application save two: driving a set of rock-shaped speakers in my backyard and cranking up all of the keypads in the house for a party. It is easy, though, to add more power where you need it. Each keypad has terminals that allow your installer to connect a more powerful amplifier, or to add a subwoofer to augment the bass in any room that needs the additional oomph.

Certainly, some homeowners will demand the superior sound quality and flexibility of high-end multiroom systems, and some will want to access more than four audio sources for multiroom sound. But if you can live with this system's limitations, it will be one of the most useful home improvements you can make because you will use it every day. **I missed my first A-BUS system terribly when I recently moved, and am so thankful to have the new one installed. I have tested more than 500 electronics products in my career, including astoundingly good speakers, amplifiers and surround-sound processors. No other, though, has brought me as much joy as this one.** HF&D

■ DESCRIPTION

Four-room/four-zone multiroom audio system, including power supply, hub and four keypads. Requires Cat-5 cabling, speakers and separate audio sources.

■ CONNECTIONS

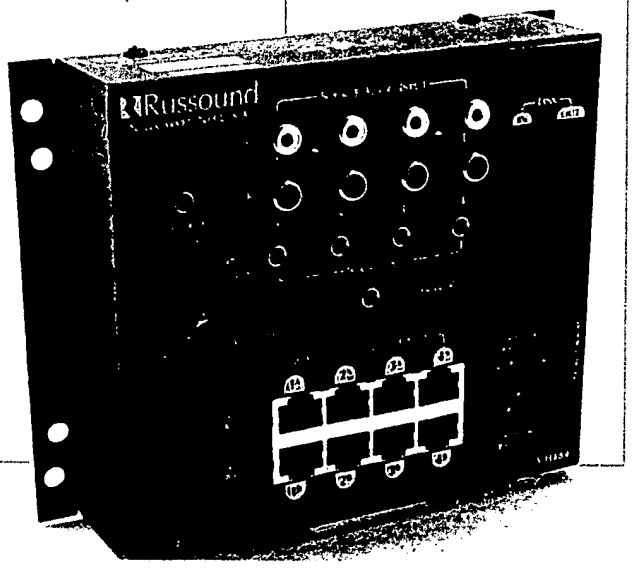
A-H484 Hub: Four analog stereo audio inputs, four 3.5mm minijack outputs for IR remote control repeaters, eight RJ-45 keypad connections, power supply input.
A-KP2 Keypad: eight-conductor push-down type connector for Cat-5 cable, block connectors for stereo speaker output and line output.

■ DIMENSIONS

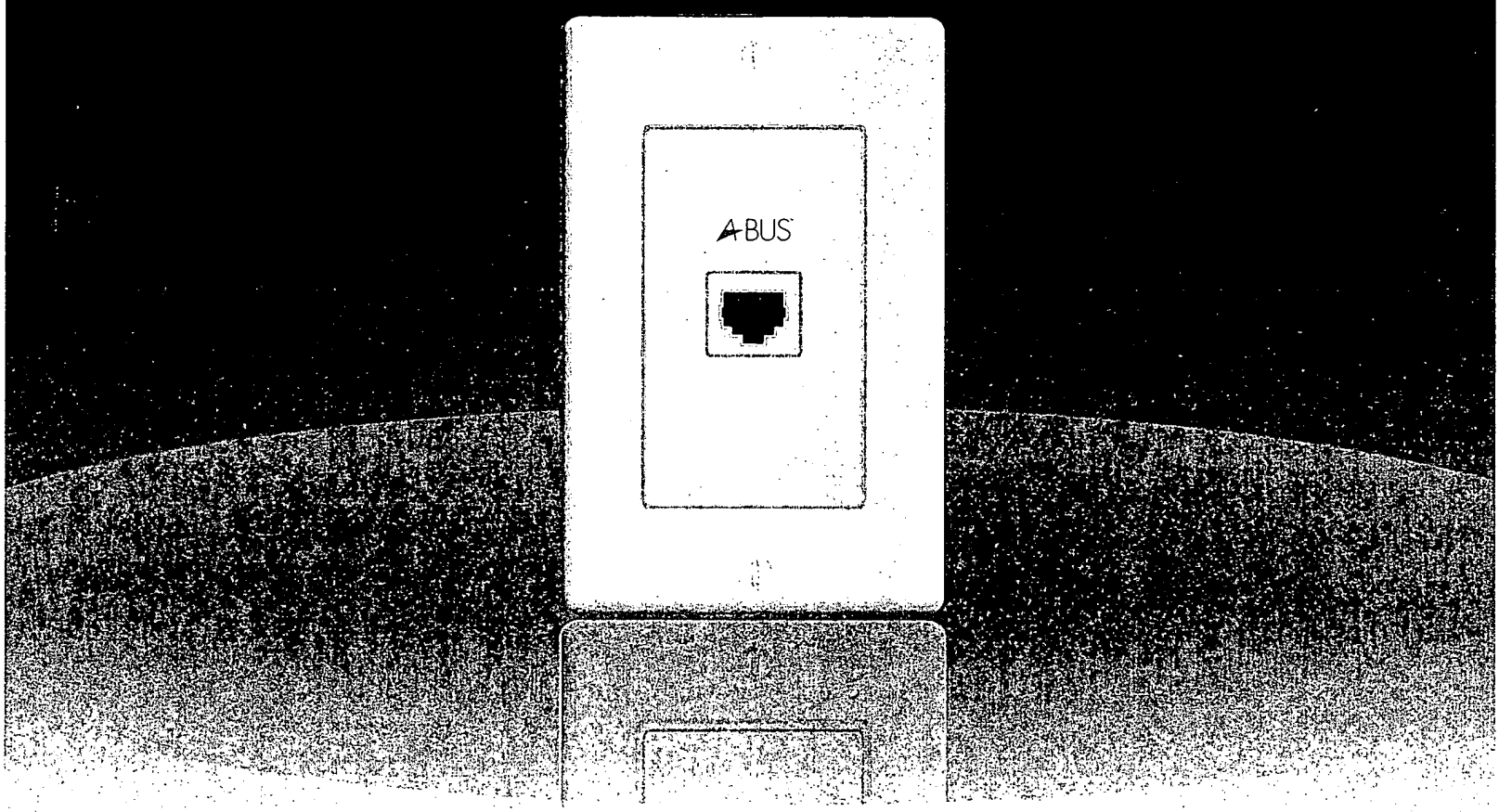
A-H484 Hub: 5 x 6.4 x 1.8 inches (hwd).
A-KP2 Keypad: 2.6 x 1.3 inches (hw); fits Decora faceplate.

■ PRICE/CONTACT

PRICE: $1,499 for basic kit (four keypads, one A-H484 hub, one power supply, one universal remote control, one A-LC2 input module and accessories), plus installation.
CONTACT: (603) 659-5170
www.russound.com



THE EASY WAY TO MULTI-ROOM AUDIO



A-BUS™

Have You Heard It?

Letter from Andrew

Andrew Goldfinch, co-creator of A-BUS™.

Many people have asked me how we developed A-BUS™. To answer to that would take a long time, but the simple answer is we wanted to get the basics right.

Technically, we knew long runs of speaker cable through a home was not right. Everyone knows the amplifier should always be as close as possible to the speakers.

Being able to do everything in one cable was a key requirement, but that one cable being a category 5 cable was a bonus which we did not expect.

It is also important to have a good understanding of your market and what the consumer really wants. Too often we find manufacturers designing products around their technology and not around the consumers needs.

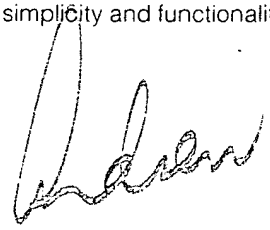
They also want everything to vanish, no messy wires and no ugly boxes, otherwise they would save a lot of money and put a midi system in every room.

The real success of A-BUS™ is the advantages a one cable solution offers to everyone, from builders and architects, to systems designers to consumers. If you look at A-BUS™ in these terms you will see that it is a very powerful solution.

Too often we find manufacturers designing products around their technology and not around the consumers needs.

Audiophiles want to provide thundering power in every room and system integrators want to provide a million features, but most people do not want sophisticated or complicated solutions in kitchens, bedrooms and bathrooms. Consumers want simplicity and functionality.

"The real success of A-BUS™ is the advantages a one cable solution offers to everyone..."



Progress of A-BUS

No matter how you define the word 'standard', A-BUS™ has been accepted as a standard format for the multi-room audio market with manufacturers from all sectors adapting the A-BUS™ format created by LeisureTech Electronics, Sydney Australia. A-BUS™ technology is based upon the unique ability to transmit stereo audio, infrared data, system power and status down a single Category 5 cable.

A-BUS™ is now clearly being seen as an industry format for distributed audio. Its simplicity has advantages for everyone; manufacturers, system designers, installers and consumers.

Its flexibility, high quality sound and low cost makes A-BUS™ the foundation stone for market growth. A-BUS™ technology is available by license only and all partners are required to comply to A-BUS™ standards to ensure compatibility between all products bearing the A-BUS™ trademark. For further information regarding A-BUS™ licenses please contact Andrew Goldfinch at:

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www.a-bus.net
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INSTANT ACCESS TO MULTI-ROOM AUDIO

A-BUS ready

A-BUS™ offers advantages to every market sector in distributed audio. To electronics manufacturers A-BUS/ready™ means instant access to distributed audio, the advantages are significant.

A-BUS™ - A Standard for Future Growth

LeisureTech is working with the industry to not only create a format that is simple for everyone to adopt but a standard that will allow all manufacturers products to interconnect to provide maximum flexibility to consumers. The A-BUS™ "plug and play" approach will provide a strong foundation for custom audio market to grow into a broader consumer market.

A-BUS/ready™ - To 'B' or not to 'B'

A-BUS™ is the 21st century replacement for the 'B' speaker outlet on amplifiers. The traditional 'B' speaker outlet no longer provides a real benefit to consumers. In a secondary room remote control is vital and because most amplifiers only have a toggle button for ON/OFF the operator needs to know if the amplifiers status is on. Secondary speakers often place difficult loads on amplifiers and systems with long cable runs and volume controls connected reducing overall system sound quality. A-BUS™ is the new way to 'B'.

"The A-BUS™ trademark is fast becoming one of the most noticed names in the distributed audio market"

Integra DTR 6.3 - 6.1 Channel A-BUS/ready® Home Theater Receiver

The A-BUS™ Trademark

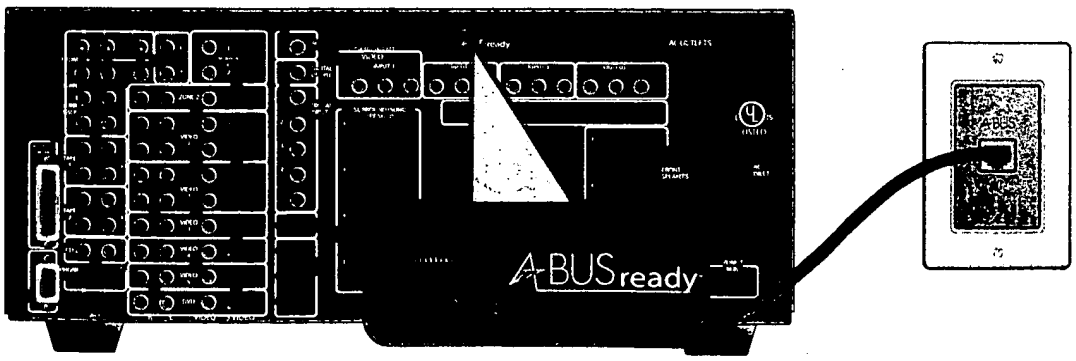
The A-BUS™ trademark is fast becoming one of the most noticed names in the distributed audio market. All A-BUS™ partners display the A-BUS™ logo on their A-BUS™ products, A-BUS™ products have been receiving regular awards and A-BUS™ is receiving regular comment in the trade press. A-BUS™ is seen as the distributed audio standard of the future.

A-BUS/ready™ Offers Flexibility

A-BUS™ can simply be one RJ-45 socket delivering audio and status out and IR data in. Options can include system power in the output. The output can be the single zone on basic models and second zone on premium models. Future options may be to provide individual source selection for multiple outputs.

A-BUS/ready™ is Easy to Install

The cost to equip an A-BUS/ready™ amplifier is easy. Little modification is required. A simple A-BUS/ready™ outlet is an RJ-45 socket with stereo line level (with increased gain) and status (voltage trigger) out and IR data in. No proprietary parts are required. With all the requirements of today's modern amplifiers space on the back panels can be very tight. A-BUS™ can be as simple as a single RJ-45 socket.



STRUCTURED WIRING AND OEM

A-BUS™ *in the Structured Wiring Market*

A-BUS is set to make a big impact on the fast growing structured wiring industry. It is a fast growing market with a massive 50% of new homes in the US expected to incorporate a structured wiring panel by 2004. The simplicity of A-BUS creates many advantages for this dynamic market.

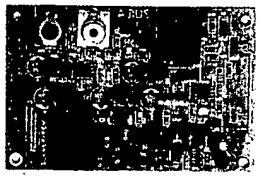
OnQ Technologies, a leading manufacturer in the home networking market, was the first company to integrate A-BUS technology as part of a home network system in January 2002. In January 2003 A-BUS products will also be shipped by AMP/Tyco, Channel Vision, Greyfox, Home Director and UStec. The commitment by these companies has made A-BUS an industry standard for audio distribution that gives builders, system designers, installers and new home owners clear wiring guidelines for their audio requirements.

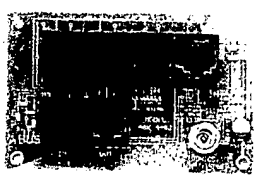
A-BUS is ideal for use in the structured wiring community because it relies on category 5 cabling. The use of category 5 cabling also makes it easier for installers from other disciplines to be trained to install A-BUS audio distribution systems. Currently seven leading suppliers are training their installers to wire homes for A-BUS

A-BUS is a BIG space saver. In the family area where space for the home theater system is often limited, A-BUS distributed audio is simply an RJ-45 socket on the wall. In the structured wiring panel the A-BUS hub(s) is/are also compact and functional. The number of zones is not limited at all since the 4-way distribution hubs include expansion ports for multiple hubs.

The lower cost of wiring for A-BUS means that more rooms will now be wired for audio creating homes with higher perceived value for the builder and a future asset for the audio industry.

OEM a fast and efficient service for manufacturers

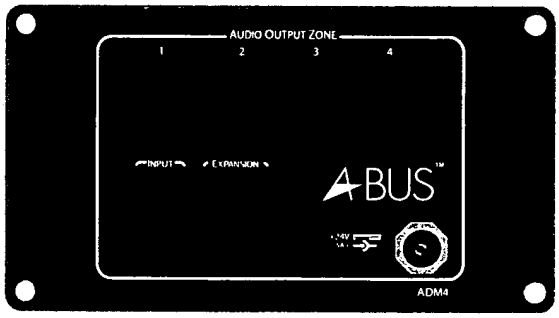




In partnership with SCI international, a well known supplier of OEM audio components to US manufacturers based in Nashville Tennessee, LeisureTech is now offering A-BUS™ OEM products to manufacturers.

With manufacturing in Asia, LeisureTech has been keen to ensure high quality A-BUS™ products are made. This arrangement provides for production engineering, supervision and quality control from Australia, and design and technical support for clients provided in the US. Products can be warehoused in the US or shipped directly into store with the minimum of fuss.

For those who require special engineering and styling, assistance can be provided with competitive pricing on tooling, etc. SCI has extensive contacts in Asia to source a wide range of audio products for OEM supply.



A-BUS™ Structured Wiring Panel Distribution Hub

"The CAT-5 architecture is ideal for home networking application. It allows the system designer and the installer to work consisitently with CAT-5 saving time, money and potential mistakes"

- Doug Fikse, President
- OnQ Technologies

A-BUS

AWARD WINNING PERFORMANCE

Electronic House Top 50 Products of the Year

Year 2001 -

Russound A-BUS Multi-Room Distributed Audio System

Year 2002 -

Russound A-BUS A-H484 Multi-Source Hub

Year 2002 -

OnQ A-BUS Audio System

Electronic House EXPO (EHX) Distributed Audio Awards

Best Multi-Room Category -

Russound A-BUS A-H484 Multi-Source

Best overall Category -

Russound A-BUS A-H484 Multi-Source

Alternative Transmission Technology -

OnQ Technologies A-BUS 4-Room Finish Kit

C E Pro C E Pro High Impact Products of the Year Award

Year 2002 -

Russound A-BUS System

Audio Video International Magazine's Hi-Fi Grand Prix Award

Year 2002 -

Russound A-BUS System

CES Innovations Award

Year 2002 -

Russound A-BUS System With Multi-Source (A-H484, A-KP, ALRC-1)

Year 2001 -

Russound A-BUS Multi-Room Distributed Audio System

Audio Video Interiors Excellence in Design Award

Year 2001 -

Russound A-BUS

CEA Mark Of Excellence Award

Year 2002 -

OnQ - A-BUS System

Everyone loves A-BUS™

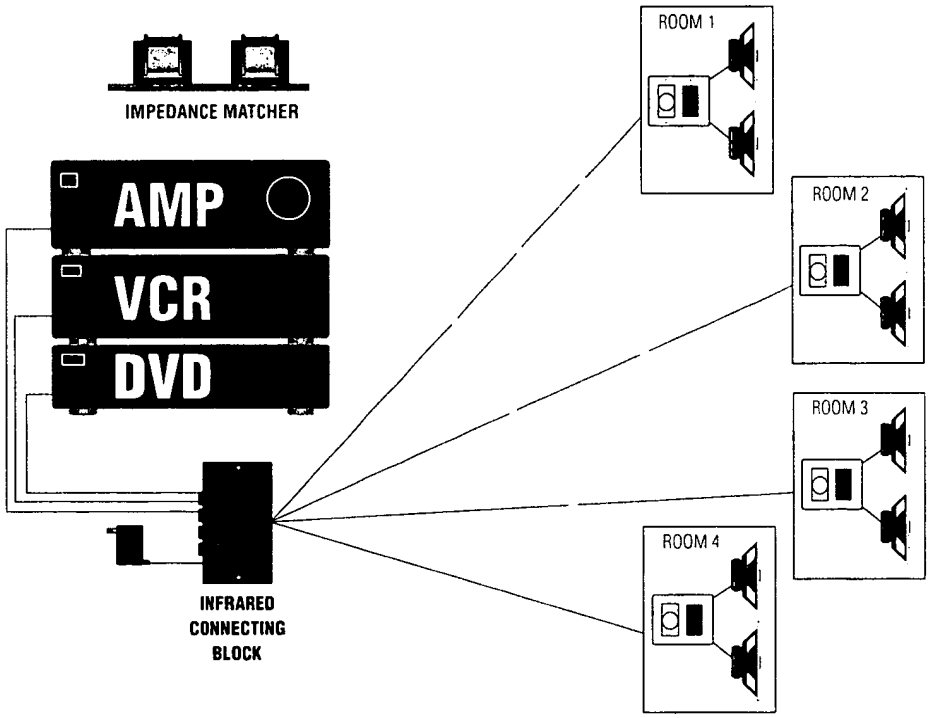
Even the girls...

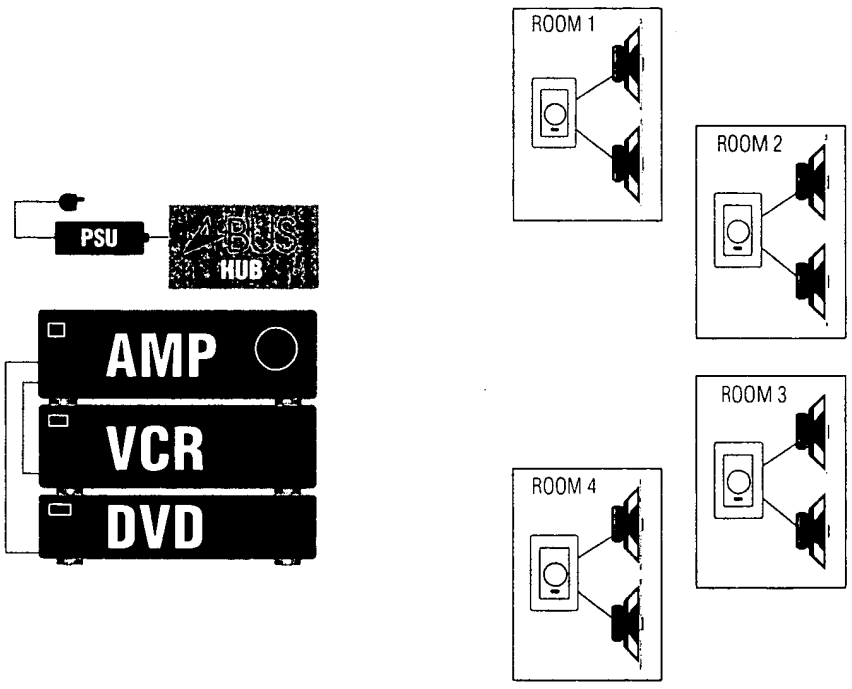
A-BUS™ was included in the Girls Best Friend showcase at the 2003 International CES

"The award winning A-BUS™ line by Russound represents state of the art in multi-room audio yet it is attractive, simple to use, affordable and sounds great."

TRADITIONAL LIMITATIONS

- Degrades sound quality
- Volume levels in all rooms rely on the main amplifiers volume setting
- Volume can only be turned down (attenuated) in remote rooms
- Stepped level control, Requires impedance matching
- Separate Infrared system required
- No status
- System needs to fully designed before installation
- Limited expansion





A-BUS ADVANTAGES

- High quality audio
- Volume control can be individually adjusted (including the main room)
- Infinite volume adjustment
- One category 5 cable includes Infrared data and status
- Easy to design and install
- 1 to 100+ rooms
- Wiring allows for either single source or multi-source
- Upgradeable to future technologies
- Compact

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Is the ABus Going Your Way?

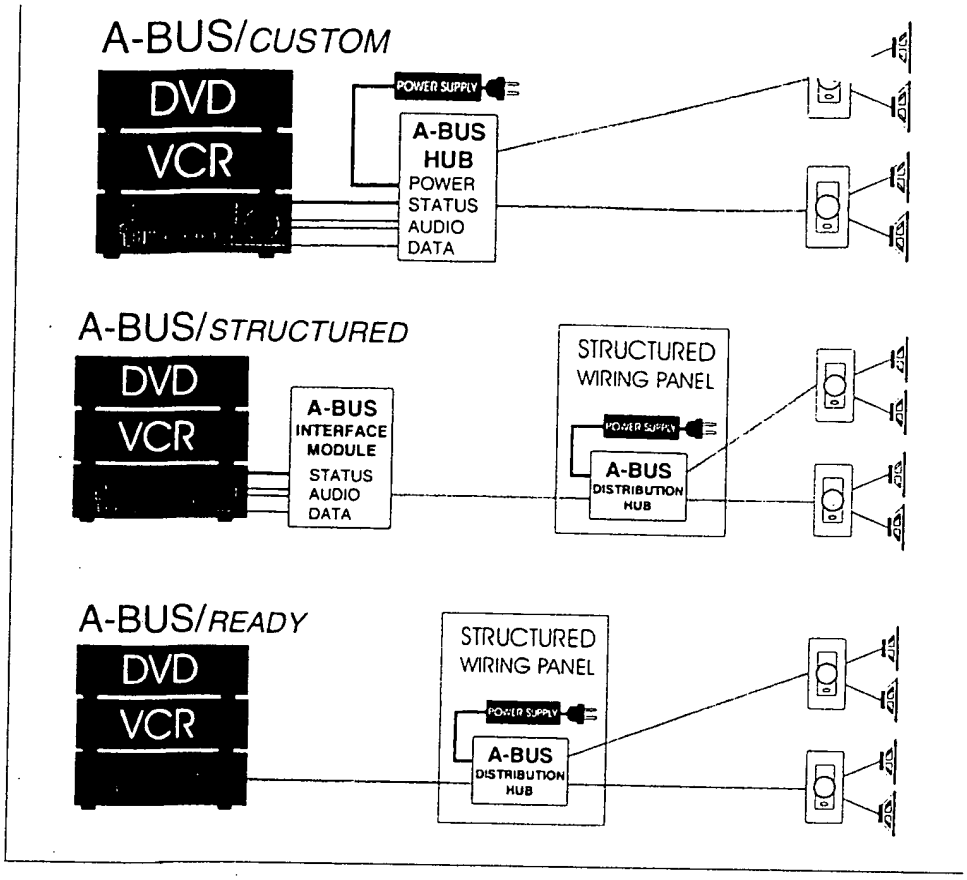
<BY RON GOLDBERG>

Anyone who either designs or markets technology products can tell you it isn't easy to go against an established order. In the case of Sydney-based Leisuretech Electronics, developer of the ABus audio distribution system, the challenge has been taken up on two fronts. ABus is not only a departure in terms of technology, but also a marketing challenge. How do you get system designers and C-tailers to go against a well-established, decades-old paradigm?

According to Andrew Goldfinch, president of Leisuretech, it's about offering a simpler product that can still claim to be a better mousetrap than the status quo. His company's ABus system, which is available both via established product lines and also as a licensable technology, is trying to change the way audio is carried around the house. Recent licensees are showing that the idea may be catching on. Says Goldfinch, "We see it not as a product, but as a platform. It makes the whole way you do distributed audio easier, with a better sound in the end."

A lofty claim, but one that's finding more adherents. Because it was first to market with ABus-enabled products, Russound is often perceived as "the ABus company." But the ABus technology's reach has been steadily increasing, with powerhouses like UStec, Home Director, ChannelVision and recent Leviton acquisition, OnQ, now offering ABus products. Recently, mass market audio vendors Harman Kardon and Onkyo began offering consumer-level home theater receivers with ABus capabilities. The radical idea that Goldfinch and Leisuretech Chief Engineer Len Andrews first came up with in 1991 is getting its moment onstage.

The basic concept behind ABus is to distribute audio as a line-level signal to the local zone for amplification, rather than speaker-level output from a centralized location. One CAT5 cable carries the audio, IR data, operating power and signal status from a what ABus calls a "Central Power Unit," which accepts signals from the traditional A/V source components. The CPU contains system connectivity and the amplifier's power supply, which is the biggest physical component of an audio amp.



In practice, this means that each of the local listening zones features amplification capabilities, or more accurately, parts thereof. In traditional audio amp design, whether it be stereo, multichannel or multi-zone, the power supply is what's taking up all the space. Outside of the power supply, the other components that comprise an audio amplifier are relatively small and simple to compartmentalize — even into something as small as a wall plate.

The benefits of the ABus "divide and conquer" approach are easy to see in theoretical terms, and in Goldfinch's opinion, to hear as well. The extensive speaker cable runs that extend from the central amplifier location in a typical custom installation become unnecessary. The attendant loss of quality through transformers, impedance matchers, power drop-off, capacitance and inductance is largely eliminated.

Says Goldfinch, "We're all custom installers ourselves. We started in the 1960s and saw the traditional way people were doing distributed audio, with attenuators, step devices, etc. The whole system ended up with loss. The ABus works off line level, the amp in the room doesn't affect the rest of the house. You get a good clean signal for every room in the house."

The ABus system can be configured for three different custom install situations. For situations where the entire implementation will be done with ABus, the source components feed an ABus hub, which then distributes signal to the local zones and ABus controllers. For installations where the structured wiring is already in place, an ABus interface module carrying system status, audio and data is connected to the structured wiring panel, which would also include an ABus distribution hub. Finally, installations can be made "future-ready" for ABus capabilities. If a pre-wire job includes an ABus hub, current and future A/V equipment with ABus capabilities can simply plug in.

ABus may be meant to appeal to the installer market, but its various purveyors are clearly looking to the builder community to help out with the evangelizing. Says Russound's Director of Marketing and Public Relations Peter Hoagland, "It's a particularly powerful product for new home construction. We were just at the Builder Show, and something that's simple to install and simple to use is just what they're looking for." Goldfinch agrees, saying, "It's good for people in the building industry because you have clear guidelines and a standard solution."

Whether ABus will become that standard solution, or part of it, remains to be seen. But the custom-install business is still in its formative stages. With structured wiring services now available from so many different sources, a simple path for the builder, C-tailer or system designer, may turn out to be a popular one. **CR**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Distributed Stereo System
Leonard Colin Andrews
Group Art Unit: 2644
Serial No.:09/485,657
Examiner: Justin I. Michalski
Filed: March 24, 2000

DECLARATION UNDER 37 CFR 1.132

Jason Knott declares as follows:

1. I am the editor-in-chief of CE Pro [Custom Electronics Professional], a publication of EH Publishing, Inc., which is the leading trade publication for installers, retailers and VARs in the custom electronics industry. We have a current audited circulation of over 35,000 readers. The company also runs the Electronic House Expo, which is a major annual trade show for the industry. I have been involved in publishing within this industry since 1990. It is part of my role to seek out and evaluate the innovations and emergent technologies in the industries served by our readership.

2. I first became aware of the distributed audio system known as A-BUS in 2000. A-BUS is a distributed stereo audio system using a Category 5 four-pair twisted cable to carry at least audio signals and system power from a power supply and source in one room to amplifiers and speakers in another room. The audio signal is carried on two of the pairs of the cable and power is carried on a third pair. The fourth pair can be used for data and status signals.

3. The introduction of the technology developed by LeisureTech Electronics of Sydney, Australia through its A-BUS products has made a major impact on the consumer electronics industry and specifically in the custom installation category. The footprint of A-BUS is getting bigger every year in that sector with a growing number of manufacturing companies from all areas of the industry that have adopted the A-BUS format. A-BUS products were featured in Electronics House Magazine's Top 50 products of the year in 2001 and 2002. They also received several industry awards from the Electronic House Expo, including Distributed Audio Awards for Best Multi-Room category, Best Overall Category and Alternative Transmission Technology.

4. Market acceptance has been based on the simplicity of the A-BUS system. In an industry where new technologies appear on almost a daily basis, A-BUS has succeeded

4. Market acceptance has been based on the simplicity of the A-BUS system. In an industry where new technologies appear on almost a daily basis, A-BUS has succeeded because it provides simple solutions, rather than complex processes. A-BUS only needs a single Cat 5 cable from the main audio system to the distribution hub(s) in the structured wiring panel. In the past, traditional systems suffered from signal degradation from long speaker cable runs. Many in the industry believed that the low-gauge cable could not deliver enough power and that it would suffer from noise problems. LeisureTech claims to have overcome these concerns in a way that enables A-BUS to deliver high-quality signal to every room.

5. The use by A-BUS of Category 5 cable has had other advantages. Installers are already familiar with Cat 5 and have the tools and experience to handle the cable quickly and efficiently. It is also an inexpensive cable with a low profile and a damage-resistant outer sheath that makes it more cost-effective and easier to install than heavier speaker cable and data cable required for traditional systems. Additionally, because of the familiarity of Cat 5 wire in the construction and home security industry, the simplicity of A-BUS makes it possible for installers from associated professions such as security, data and electrical to design and install multi-room audio systems with A-BUS without special training. The low cost of Cat 5 cable makes it practical for builders to pre-wire the whole house for multi-room audio. The new homeowner may choose to install a simple A-BUS system or a sophisticated A-BUS system with multi-source capability. A-BUS systems are very easy to upgrade using standard Category 5 connectors.

6. With the simplicity of A-BUS and its use of Cat 5 cable, LeisureTech has been able to create an industry platform that has attracted companies from all areas of the audio market. One reason for that attraction is that A-BUS-enabled products are compatible with all other A-BUS products. For example, receivers from Harman/Kardon and fromOnkyo Integra have A-BUS/Ready sockets which serve to replace the traditional Speakers 'B' facility and provide an outlet to easily extend audio entertainment into as many additional rooms as required.

7. In the traditional custom audio market, Russound has a wide range of A-BUS products and PhaseTech, a Florida-based speaker manufacturer, has introduced A-BUS as its multi-room solution, as have other speaker manufacturers such as OPUS (UK) and Jamo (Denmark). In the fast-growing structured wiring market, which provides telephone, data, video, security from a centralized panel, A-BUS has become a well-accepted audio distribution standard with many major suppliers now offering A-BUS solutions via Category 5. These include: OnQ Hone, Honeywell, AMP/Tyco, EATON, Home Director, UStec and Channel Vision.

8. A-BUS technology has played a key role in the rapid growth and expansion of multi-room entertainment in our industry. I believe this is because A-BUS multi-room audio systems provide a combination of reliable performance coupled with value and quality.

9. Attached to this declaration are true copies of articles published in our magazines

relating to A-BUS technology.

All statements which I have made in this Declaration of my own knowledge are true, and all statements which I have made in this Declaration on information and belief are believed to be true. I have also been warned that willful false statements and the like are punishable by fine or imprisonment, or both under §1001 of Title 18 of the United States Code and may jeopardize the validity of this application or any patent issuing thereon.

Date: 11/29/04

Jason Knott

Structured Wiring Systems 101

Understanding the three key levels of functionality in a structured wiring package is important to help you determine the best fit for your customer.

by John Galante

ROI

- By 2004 nearly half of all housing starts will include structured wiring. Stay ahead of the curve.
- Understand the lingo and know what questions to ask before you start shopping.
- A comprehensive list of resources will help you get started.

Structured wiring systems are hot. Promoted by suppliers and installing companies as the "fourth utility" and "digital plumbing," structured wiring systems have increased market penetration from fractions of a percentage in the mid '90s to better than 12% last year in single-family home starts, according to the Dallas-based research firm, Parks Associates. By 2004, Parks projects that nearly half of all starts will include a structured wiring system. ■ **The Primary Components** A number of manufacturers offer structured wiring systems. Following a definition created by Wiring America's Homes, a consumer educational campaign of the Home Automation & Networking Association (*www.connectedhome.org*), a system is composed of three main parts.

First, a service center, also called the distribution panel, works like a sophisticated switchboard. Outside services, including cable TV, telephone, DBS satellite, Internet and the like, enter this panel and are distributed to locations throughout the house. The system is similar to the one used by electrical breaker panels in controlling electricity flow.

Certain services like digital cable, digital satellite, high-speed Internet and HDTV require the second part of the wiring system, high-performance cables, to allow full access throughout the home. Most systems include RG-6 coaxial cable for TV and video distribution, and Category 5 or better twisted-pair cable for telephone and data. RG-6 coaxial cable provides maximum protection from interference with the TV picture. Category 5 or better cable provides high-speed access to multiple phone lines without cross-talk. Because the coaxial and twisted-pair data and phone cabling are frequently run together to universal service outlets, they are often bundled to simplify installation (See Table, page 62.)

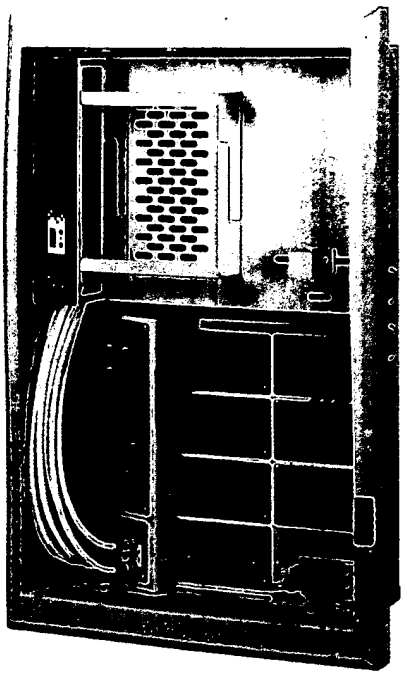
Each room has the third part of the wiring system, the outlet, which can be customized to users' specific needs based on which services they want in each room (cable, Internet access, telephone, etc.). Outlets that feature connections for voice, video and data services on a single plate are coming to be known as multimedia or universal service outlets.

Key Differences

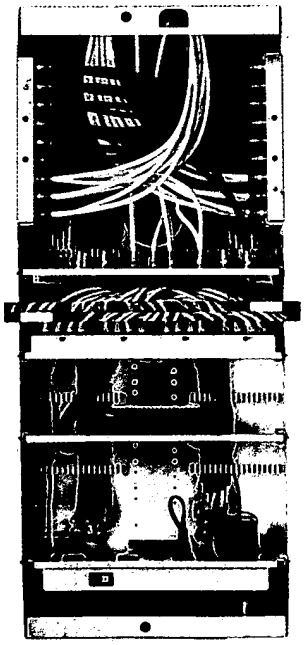
Functionally, there are few differences between structured wiring systems. "All these systems will essentially behave the same to a certain degree," says Doug Fikse, president of OnQ Technologies, a major supplier of structured wiring packages. "Where a builder has to make his evaluation is on delivery, service and the program that [the manufacturers] wrap around their products."

"There are a lot of companies that take the existing telephone and TV requirement and do nothing more than provide a connection and good cable for that," Fikse continues. These companies may call such solutions "structured wiring," but in most cases, homebuyers will demand more features for their money. This will require a structured wiring system with greater intelligence. Manufacturers provide this intelligence in the form of modules that install into the distribution panel. One module, for example, might facilitate a computer network; another might distribute DSS to various outlet locations. Without these modules, a distribution panel is nothing more than a box into which wiring terminates.

The types of modules and the number of outlets included in a package differ between manufacturers. Some packages might include a cable modem for Internet access; some might distribute video to four locations; still others might reach as many as 12. Explore the features included in each package to determine the best one for your market. Not all features that sound great are actually practical. A structured wiring system that comes with a DSL modem, for example, will require that a home have access to DSL service. Also consider whether a package includes additional wiring for security and audio. "In our recommended scenario we had prewiring for security, for audio, and we strongly recommend that in at least one outlet in each major room there be a Category 5 RG-6 configuration," says Mark Schmidt, Home Director vice president of sales and marketing. (Home Director is a networking technology company delivering products and services for home networking solutions.) With so many options available, it's difficult to pinpoint a cost for a structured wiring system. Generally, the range is from $750 to $2,000, installed.



■ The Ilan 800b home networking server by UStec, above, and the Home Director Network Connection Center, below, are examples of structured wiring system distribution panels.

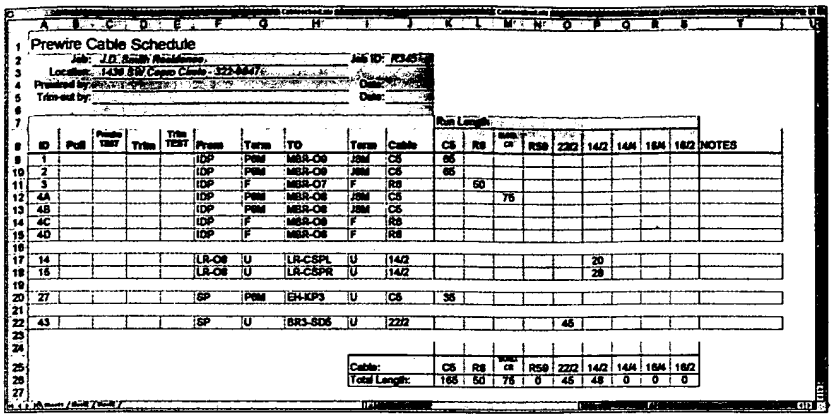


Three Levels of Solutions

Wiring America's Homes has established three solutions for structured wiring systems in new homes, based on the approved industry standard (TIA 570-A). The recommended solution provides an infrastructure to support basic and advanced systems, including multimedia and interactive communications services, home-office components and distribution of digital television signals. The minimum solution provides an infrastructure to support and integrate basic systems—such as telephone, satellite, CATV and data services—now, while allowing for customization and evolution as new technologies are developed. This solution limits access to many services derived from the broadband pipe (used in the recommended solution). The upgraded solution integrates the recommended solution with an added step to allow for easy upgrading of the wiring system. This includes the installation of 2-inch PVC piping from the attic to the basement for ease of installing future wires and/or fiber optic cable, which provides maximum available bandwidth.

Standard Wiring on the Way

The Telecommunications Industry Association's TR 42.2 Committee, responsible for the maintenance and updating of the TIA 570-A Residential Cabling Standard, started work on an addendum to the standard last year. The addendum will address prewiring for entertainment systems (specifically surround-sound audio for home theater and multiroom audio), control systems (automated lighting, HVAC and whole-house control) and security. The committee's goal is to finalize draft standards for infrastructure wiring of these subsystems by the end of the year. A meeting will be held in conjunction with the Electronic House Expo in Long Beach, Calif., Oct. 24-27, 2001. For more information, visit *www.tiaonline.org*.



Prewire Cable Schedule

ID	Pull	Pull TEST	Trim	Trim TEST	From	Term	TO	Term	Cable	Run Length C5	RG	Quad CX	RG6	2/2C	14/2	14/4	16/4	18/2	NOTES
1					IDP	PBM	MBR-O6	JBM	C5	65									
2					IDP	PBM	MBR-O6	JBM	C5	65									
3					IDP	F	MBR-O7	F	RG		60								
4A					IDP	PBM	MBR-O8	JBM	C5			75							
4B					IDP	PBM	MBR-O8	JBM	C5										
4C					IDP	F	MBR-O8	F	RG										
4D					IDP	F	MBR-O8	F	RG										
14					LR-O8	U	LR-CSPL	U	14/2						20				
15					LR-O8	U	LR-CSPR	U	14/2						28				
27					SP	PBM	EH-KP3	U	C5	55									
43					SP	U	BR3-BD6	U	2/2C					45					

Cable:	C5	RG	Quad CX	RG6	2/2C	14/2	14/4	16/4	18/2
Total Length:	185	60	75	0	45	48	0	0	0

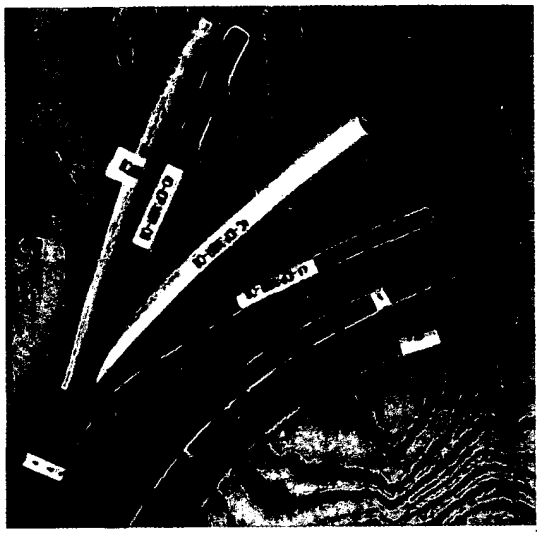
■ A cable installation schedule can be created in a standard spreadsheet or word processor program. Key fields should include cable ID of each line, even if it is part of a bundled cable.

System Documentation, Labeling, Test & Inspection

Another unfinished piece of business in the standards arena is documentation and labeling of system components. The TR 42.2 Committee referred development of this standard to another TIA committee working on the same standard for commercial buildings. Meanwhile, more and more systems are installed, some, unfortunately, without proper documentation. According to Helen Heneveld, vice president of The Training Dept., a leading training and education provider in the structured wiring arena, installers should document the destination, purpose, and cabling type of each run and should label all cables at the distribution device, including those not connected. The Training Dept. also recommends that each cabling run be tested for continuity (i.e., the run connects the jack to the intended service), length and resistance (i.e., signal loss

Around the Lingo

Features	Description	Benefits
Distribution box	The distribution box is a stand-alone piece of equipment that contains distribution devices for voice, data and video. It must be located in a place that is readily accessible to cabling maintenance.	The distribution center allows the wiring system to be customized and updated as technologies are developed. It provides universal access to various networking elements within the home as well as connectivity to service providers.
Star topography	All cables are strung in a star formation that allows all wires to have a direct link from the distribution box to the outlet.	The efficient star topography allows system changes to be made without the hassle of having to pull new wires. In addition, services are not disrupted or impaired by other online connected devices.
Universal service outlets	These outlets are designed to support a full range of communication technologies with a variety of flexible configurations, including voice, data and video jacks.	Universal outlets allow the homeowner to determine which technologies will be used in each room in the home. Even after wiring system installation is complete, outlets can be changed to meet the homeowner's changing needs.
Recommended wiring	Recommended wiring consists of: ■ two CAT 5 cables (CAT 5e preferred); ■ two RG-6 quad-shielded coax cables; ■ one dual CAT 5/dual coax outlet to key rooms in the house, including home office/den/study, kitchen, family/great room, each bedroom, multimedia room, master bathroom, utility room, dining room.	Recommended wiring provides for basic and advanced services, including multimedia and interactive communication services. This grade supports both current and developing technologies including multiple communication technology in the home office (multiple computers, fax machines, phone lines, etc.) and extensive home-theater capabilities (DVD, etc.).
Minimum wiring	Minimum wiring consists of: ■ one four-pair UTP CAT 5 cable; ■ one RG-6 coaxial cable to key rooms in the house, including home office/den/study, kitchen, family/great room, each bedroom.	Minimum wiring provides the basic structured wiring required for telephone, satellite, CATV and data services. This allows a homeowner to reap basic benefits such as multiple phone and modem lines and satellite television. Minimum wiring, while technically compatible with current cable modem or DSL broadband services, limits access to many services derived from the broadband pipe.
Upgrade wiring	This wiring is the same as recommended wiring, plus 2-inch PVC piping from the attic to basement to ease installation of additional wiring or fiber optics in the future.	Upgrade wiring is a kind of contingency plan to accommodate the unknown future of telecommunication services and technology.

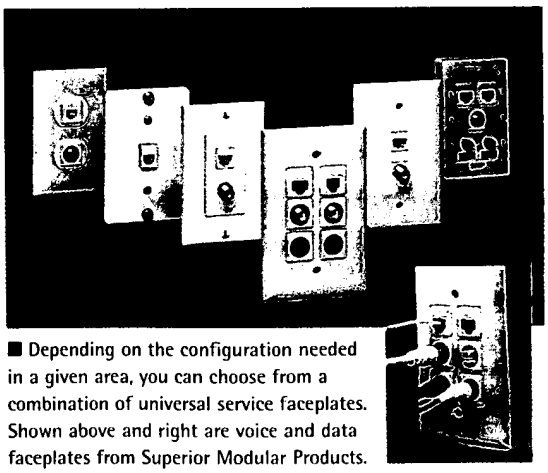


■ Cables should be labeled before pulling.

over distance). For Category 5 cabling, installers should perform wire mapping to ensure that the four pair of cabling are connecting the desired service to the desired jack. Field-test instruments are available through vendors such as Microtest and Fluke to assist in this process.

The standards committee will continue to define and specify the parameters for structured wiring, but OnQ's Fikse indicates that there's no time like the present for builders to integrate structured wiring programs into their construction plans.

"This is a sign of the times," says Fikse. "You're going to have to have more and more applications that are going to tie into this network kind of wiring, and for a few hundred dollars you can have it in your house, rolled in your mortgage for a few bucks. It's a small investment relative to the benefit that you get down the road, and even currently in the short term. Now is the time to do it." THB



■ Depending on the configuration needed in a given area, you can choose from a combination of universal service faceplates. Shown above and right are voice and data faceplates from Superior Modular Products.

Resources

Manufacturers	Distrib. Panels	Wire & Cable	Outlets	Test Equip. Inst. Tools	Contact
ADC	x				www.adc.com
AMP (net connect)	x				www.amp.com
Avaya	x				www.avaya.com
Belden		x			www.belden.com
Belkin	x				www.belkin.com
Channel Vision Tech.	x	x			www.channelvision.com
CommScope		x			www.commscope.com
Condumex		x			www.condumex.com.mx
Cooper Wiring Devices	x		x	x	www.cooperwiringdevices.com
DSC	x				www.dsc.com
Elan Home Systems	x				www.elanhomesystems.com
Elk	x				www.elkproducts.com
Fluke Networks				x	www.flukenetworks.com
FutureSmart Networks	x	x	x		www.futuresmart.com
Genesis Cable Systems		x			www.genesiscable.com
GE-Smart	x				www.ge-smart.com
Greyfox	x				www.greyfox.com
Holovision	x				714-434-6904
Home Director	x		x		www.homedirector.com
HomeNet Technologies	x				630-585-9201
Honeywell	x				www.honeywell.com/yourhome/
Ideal Industries				x	www.idealindustries.com
Innovative Connectors	x				www.icc.com
Keystone Wire & Cable		x			www.keystonewire.com
Labor Saving Devices				x	www.lsdinc.com
Leviton	x	x	x	x	www.leviton.com
Liberty Wire & Cable		x			www.libertycable.com
Microtest				x	www.microtest.com
Mohawk/CDT		x			www.mohawk-cdt.com
Molex Premise Networks	x				www.molex.com
Monster Cable	x	x	x		www.monstercable.com
Multiplex Open House	x				www.channelplus.com
Nordx	x				www.nordx.com
OnQ Technologies	x	x	x	x	www.onqtech.com
Ortronics	x				www.ortronics.com
Panduit	x				708-532-1800
Pass & Seymour	x				www.pass-seymour.com
Remee		x			www.remee.com
Siemon Co.	x		x		www.siemon.com
Signature Wire	x	x			www.signaturewire.com
SmartWorld	x		x		www.smart-america.com
Southwire Cyber Tech.		x			www.southwire.com
Square D	x				www.squared.com
Sunshine Wire & Connector		x			www.sunshinewire.com
Superior Modular			x		www.supermod.com
TII Industries	x				www.tii-industries.com
UStec	x	x	x		www.ustecnet.com
West Penn Wire/CDT		x			www.westpenn-cdt.com

A SOUND Investment

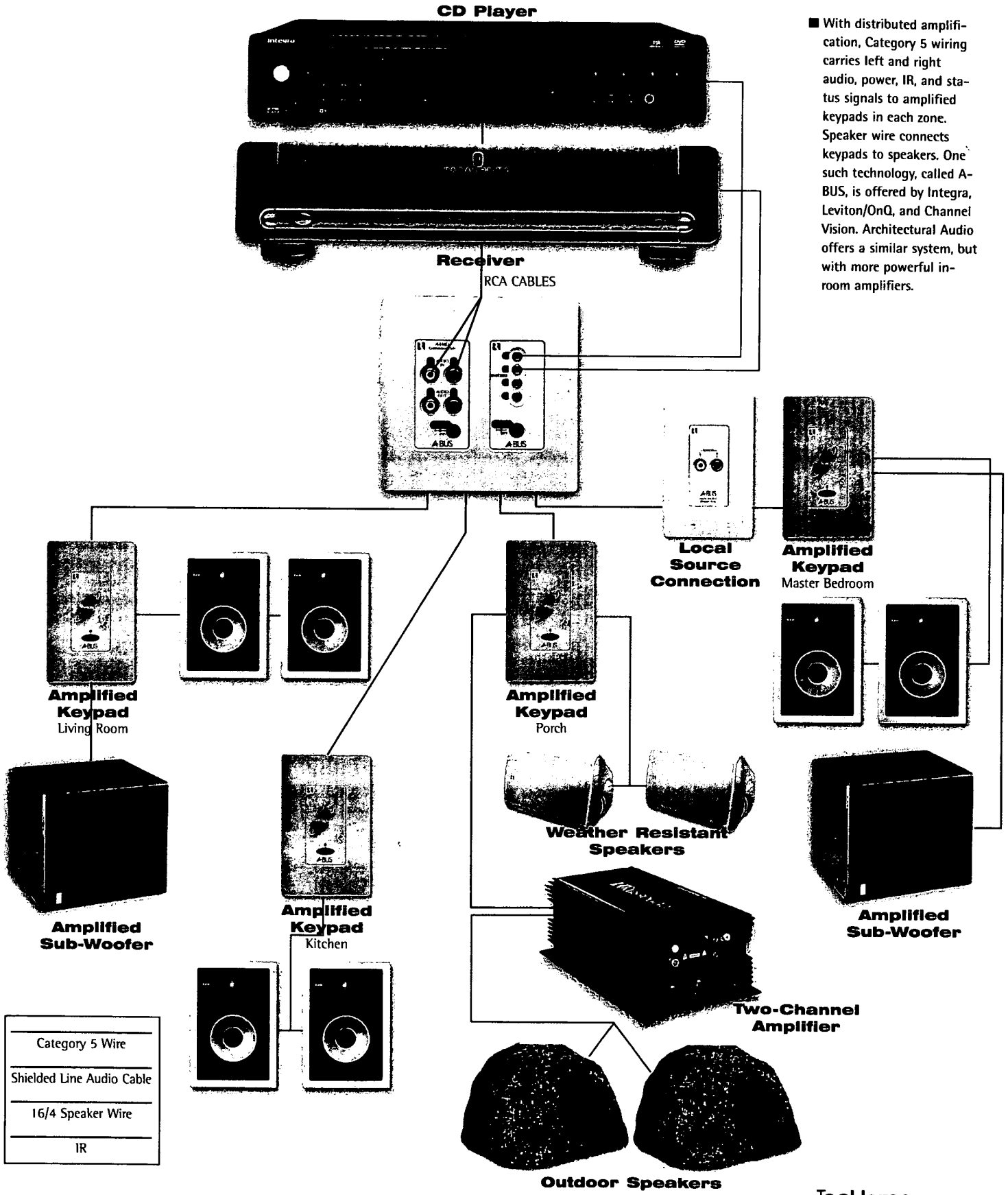
Multiroom audio for production homes

by Charles Wardell

ROI

- Cost estimates for three sample audio systems with distributed amplification.
- Tips for a quality installation.
- Examples of alternative systems.

A few years ago, virtually no production builders included multiroom audio in their homes. That's changing. According to the National Association of HomeBuilders, 57 percent of U.S. builders say they now offer it as an option. But offering and selling are two different things: only 9 percent of new homes actually got a multiroom system last year. Builders aren't selling much audio because consumers aren't asking for it. And consumers aren't asking for it because nobody is telling them about it. In fact, audio manufacturers and installers trace the problem to builders' salespeople—they just don't feel comfortable enough with the technology to present it effectively. ■ In the next few pages we provide some basic information that, we hope, will help you better understand the systems most appropriate to production homes. We will focus on one particular type of system to outline what you will get for how much money.



■ With distributed amplification, Category 5 wiring carries left and right audio, power, IR, and status signals to amplified keypads in each zone. Speaker wire connects keypads to speakers. One such technology, called A-BUS, is offered by Integra, Leviton/OnQ, and Channel Vision. Architectural Audio offers a similar system, but with more powerful in-room amplifiers.

The Distributed Audio Alliance

The Distributed Audio Alliance serves as an educational resource for consumers, builders and installers wanting to learn more about multiroom audio. The DAA consists of leading manufacturers of multiroom audio equipment and industry organizations that focus on hard-wired, professionally installed systems. Check them out at: *www.multiroomaudio.com*

A little knowledge should help you understand why the builders responsible for that 9 percent are finding multiroom audio a pretty easy sell. New technology has made these systems simpler to use and less expensive, with a basic, entry-level setup system starting at around $1500. "We hear that when builders make audio standard, not only do they increase sales but they also increase selling price," says Buzz Delano, a sales manager with audio manufacturer Sonance Systems. Builders who spec audio for their homes report that clients who had distributed audio in the past don't want to be without it in the future, and will often pay for an upgraded system.

What It Is

Multiroom audio is a professionally installed system that includes sound sources (CD players, MP3 servers, etc.), wires, controls, and speakers. The sources pipe sound to multiple "zones," usually individual rooms. Each room has its own volume control and speakers.

In the traditional audio system, a big central amplifier (at least 50 watts per channel) at the distribution point pushes an amplified signal over 16-gauge, 4-conductor (16/4) speaker wire to each room. In the newer systems, Category 5 wiring connects the amplifier to wall-mounted volume controls.

While these systems provide excellent sound, costs start at $700 per room. But recently, a less expensive technology has taken aim at the production market: distributed amplification. You can get these systems for as little as $450 per room, including sources.

There's no central amplifier in a distributed system. Instead, the source sends an un-amplified signal to a distribution hub, which may be in the living room or in the home's structured wiring panel. The signal is then sent to each room. A small amplifier, sometimes in the volume control itself, drives the speakers in that room.

Each room need be served by only one wire: audio, power, and control signals all travel over inexpensive Category 5 wiring to the in-room volume controls. As with the traditional system, two runs of 16/2 wire (one per speaker) connect each volume control to the in-wall or in-ceiling speakers it serves.

These new systems are changing how audio is sold. Rather than being seen as a separate entertainment system, audio is now as likely to be part of the structured wiring. For instance, A-BUS, the most popular distributed amplification technology, is offered by traditional audio manufacturers Russound and Integra, as well as by structured wiring providers Leviton/OnQ and Channel Vision. A similar system is made by Architectural Audio, a division of Sonance Systems.

One oft-cited drawback of distributed amplification is power. While a central amplifier might provide 25 watts of power to each speaker, A-BUS systems send only about 7½ watts. Critics say that's great for background music, but not enough to drive a home theater or fill a big room with sound. Russound counters that users can buy supplementary amps where they need more power, and still pay a lower overall system cost. (Architectural Audio's amplified volume controls send 30 watts to each speaker, with costs that start at around $500 per room.)

Pricing a System

If you're a production builder, you might want to have at least one floor plan with basic multiroom audio, along with a way for buyers to upgrade one or two levels, if they like.

Below, we describe three A-BUS type systems that would be appropriate for a production home, all with distributed amplification and Category 5 wiring. We've tried to show what buyers get for their money in each case. Prices do not include installation or infrastructure wiring.

Our Good and Better systems send the same source to every room. Our More Better system is smarter (and more expensive), letting family members listen to different sources simultaneously from different rooms. Our Best system is for custom homes. We include it for comparison only. We've listed total system costs, so you can tell your clients about how much they should budget for each system. Note, however, that the builder usually provides just the infrastructure (wiring, speakers, and controls).

Good

A typical entry-level system includes 4 zones: 3 bedrooms, each on its own zone, and the living room or kitchen on another. Each zone will have a pair of speakers and an amplified volume control. These systems can handle only a single source.

Approximate equipment cost to the client

Four amplified volume controls, a hub, a power supply: $700

Four pairs of speakers: $1,000

A DVD player: $100

Total cost: $1,800, or $450 per zone

Better

This is the Good system with infrared receivers built into the keypads. A handheld remote can be used to adjust the volume or turn the system on and off. This system can handle a couple of sources, but you have to listen to the same source in every room. Better systems also often include outdoor sound: a zone in the patio or garden. The outdoor speakers will require a separate amplifier to boost the signal.

Approximate equipment cost to the client

Five amplified volume controls, a hub, a power supply, an IR remote: $1,300

Five pairs of speakers: $1,300

A receiver: $200

A DVD player: $100

A two-channel amplifier for the outdoor zone: $300

Total cost: $3,200, or $640 per zone

More Better

For this system, take the better system and add better speakers as well as another indoor zone. (That's one out-

door and five indoor zones.) Instead of simple volume controls in each room, this system's keypads also let users choose from up to six different sources—the CD player, the music server, the receiver, or even digital music channels from the customer's satellite or cable service. A different source can be played in each zone. This system also includes one local input that's installed in one room. When a television or other source is plugged into this, sound is heard through the speakers in that room.

Approximate equipment cost to the client

Six volume controls, a hub, a power supply, an IR remote, a local input: $1,900

Six pairs of speakers: $2,400

A two-channel amplifier for the outdoor zone: $300

A receiver: $200

A 300-disc CD changer: $250

A DVD player: $100

Total cost: $5,150, or $860 per zone

Best

The "best" system is, arguably, one where the audio is part of a whole-house automation system that also controls lighting, HVAC, and other home control systems. It will include touchscreen controls made by a high-end automation manufacturer. It will probably include a digital jukebox, which can manage hundreds of CDs and MP3 files, and let users sort by type of music. These systems are found in expensive custom homes. Costs start at $15,000.

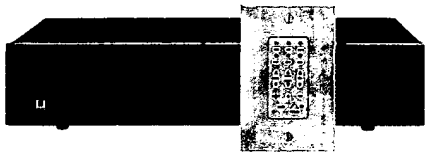
Tech Tips

Regardless of the system, good designs and installations will have certain things in common. Some tips:

- Besides the active zones listed in each sample system, you might also want to ask your installer to run Cat 5 to other rooms, and to document their terminations. With wiring prices of 5 or 10 cents a foot, the extra cost is minimal. But if the buyers want to convert the basement to a bonus room in a few years and the wiring is waiting for them, you're a hero.
- If you don't install a sound system, consider pre-wiring the home anyway. A good pre-wire system is to run Cat 5 and 4-conductor speaker wire from the source location to each potential zone. Loop the wires where each volume control will go, and continue both wires to each speaker location. That way, the system will have the necessary wiring for central or distributed amplification. And as manufacturers roll out digital systems over the next few years, with amplification at the speaker itself, having the Cat 5 in place will let the homeowner switch to the new speakers without having to snake new wire through existing walls.
- The electronics installer should run speaker wiring when the voice/data/video wiring (structured wiring) is being installed. Chances are it will be the same installer anyway. The installer should never run an audio cable through the same hole in a joist or wall stud as a high-voltage electrical wire: Magnetic interference from electrical wiring can interfere with low-voltage signals; in an audio system the result could be unwanted hum and static coming from your speakers. The electronics installer

Other Entry-Level Systems

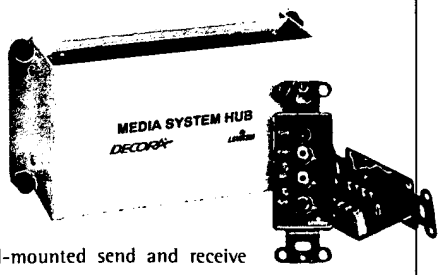
Distributed amplification isn't the only choice for multiroom audio. Centrally amplified systems remain popular, and audio manufacturers offer moderately priced systems aimed at production builders. Here's what some of the leading companies are offering. Prices do not include installation.



System6 from Elan Home Systems is an integrated audio controller and amplifier that provides 12 channels of amplification at 40 watts per channel. It allows up to six audio sources to be accessed independently by keypads located in up to six separate zones. Price: $3,990. That includes the controller, six pairs of in-wall or in-ceiling speakers, and 6 keypads. It does not include source components.

The Niles ZR4630 Multizone Receiver (the company has nicknamed it Gloria) will distribute three sources to up to six zones. It includes a built-in AM/FM stereo tuner and six stereo power amplifiers that will deliver 30 watts per channel per zone. Keypad controls are served by Cat 5 wiring, and speakers by speaker wire. Cost: $2,995. That includes the ZR-4630 plus six keypads. It does not include speakers.

The **Xantech MRC44** is a prepackaged system that will send four audio/video inputs to four zones. Any source can be controlled from any room, and multiple sources can be selected in different rooms simultaneously. Parents can control what entertainment the kids can get in their rooms. Category 5 wiring connects the controller/amp to the keypads; speaker wire runs from the controller/amp directly to the speakers. Cost: about $3,000. That includes a controller/amplifier, four wall keypads and four IR emitters. (The emitters let users control the system with a handheld remote.) It does not include sources or speakers.



Leviton's Decora Media System doesn't fit our definition of multiroom audio. Instead it's an add-on to such systems. It recognizes the fact that people have music stored in different formats—CDs, cassette tapes, MP3 files on the home computer—and that many own mini-systems like the Bose Wave Radio. The Decora System lets you play all of these throughout the house. It includes a central hub, and wall-mounted send and receive plates, all knitted together by Category 5 wiring in a star configuration. The hub takes the output from a device plugged into a send plate (a cassette player, for instance) and sends it to any device (a radio, an MP3 player, or even an old stereo system) that's plugged into a receive plate. The system can serve up to six such devices. Cost: $650 for the hub and six wall plates.

should know this. (If he doesn't, think about getting another installer.) Since the electrician might not know, make sure the electrical rough-in is done before the electronics installer begins.

- Sound quality on any system is like a chain: It will be only as good as the system's weakest link. Good speakers won't sound as good if served by a sloppy wiring job, and the best components and wiring will be only as good as the speakers you put on them.
- Long lengths of speaker wire can damage sound quality. If wire runs are too long, you can lose power and the speakers won't reproduce frequencies as accurately.
- Place in-room controls where they're convenient to use. A good spot is next to an existing light switch. That way, you won't have to worry about someone putting furniture in front of it.
- You may want to offer the option of a closet to house the source components. If so, this closet should measure about 84 inches high by 24 inches wide by 26 inches deep, at a minimum. If it's enclosed, include a ventilation fan to keep the components cool.

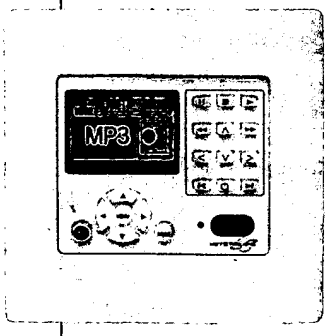
Digital Systems

Most audio manufacturers see digital distribution as the future of audio. Benefits include better control, less static, even the ability to send music to specific speakers.

Zon Audio is the first all-digital system, distributing sound over an Ethernet-based network. Sources are plugged into wall-mounted input modules. (Each zone has an input module, and sources plugged into any input can be played in any zone.) These distribute the digital signals to an amplified controller in each zone. Users can scroll through a menu to choose between sources. Short runs of speaker wire connect controllers to speakers. Cost: $500 to $600 per room. That includes an amplified controller and input module for each room. It doesn't include speakers or source.

Zon is the first all-digital system.

NetStreams' Musica distributes up to four sources to six rooms simultaneously. (It can be expanded to 12 rooms.) Like the Zon system, Musica's amplified in-room controls have LCD screens that let users choose from various menu options. The market is higher-end production builders and custom homes. Price: A six-room kit costs roughly $800 per room. That includes a distribution hub, six keypad/amplifier modules, four IR emitters, an a handheld remote. It doesn't included speakers or sources.



In September, NetStreams will roll out an IP-based system.

The current Musica uses traditional analog signals. But in September, the company plans to introduce Musica Digital: an IP-based system that, it says, will have enough bandwidth to handle high-definition television. Each device on the new system will act as a miniature Web server with its own IP address. Users will be able to search music files by a number of parameters (timeframe, artist, genre) from any IP-based device, whether a desktop computer or a handheld media device. Existing owners will be offered a trade-up option.

Speaking of Speakers

With speakers, the obvious priority is sound quality—we talk more about that in the article on that starts on page 40. But you also have to make sure the speakers are correctly sized and placed, and that they mesh with the home's architecture.

Sizing. How powerful a speaker needs to be depends on how big a room it's in. For a 150- to 200-square-foot room, a typical 2-way speaker with a 6-inch woofer will do. If room volume increases—especially if ceilings get higher—you can move up to a 3-way speaker with an 8-inch woofer. These are rare in production homes, but they handle more power because each driver gets less of it. And they take less power to fill a room with sound.

You also need to think about what people will do in each room. Because people respond best to ear-level sound, family rooms and home theaters call for relatively powerful in-wall speakers. Ceiling speakers, on the other hand, are better at dispersing sound. They're perfect for kitchens and dining rooms, where people are more likely to want background music.

Placement. Filling a room with sound is easier with correctly placed speakers. This is both an art and a science. In the family room, for instance, wall speakers should face toward the main sitting location; in the bedroom, they're best placed over the foot of the bed. (Of course you have to know where the bed will be placed.) With ceiling speakers, the best placement will depend on ceiling height. Of course the higher the ceiling, the farther apart the speakers can be. Your electronics sub should know the guidelines. You may need more than two speakers to do a proper job.

Built-in speakers can look awkward if not aligned with existing light fixtures or other built-ins. In a dining room, for instance, you might put ceiling speakers in less than ideal spots so they blend in with the recessed ceiling lights.

Aesthetics. Built-in speakers may have round or square grilles. While some designers don't have a preference, most people expect to see square speakers in walls, round ones in ceilings. Most speaker grilles can be painted to match the room's decor.

Sales Strategies

People who sell built-in audio say it's an amenity most families can agree on. "It's accepted by both sides of the family," says Chad Gallup of AVS Home Systems, a system integration company in Seattle. When working with couples, Gallup finds the husband more likely to want a dedicated theater room, but he says that both husband and wife quickly warm up to audio.

When presenting an upgrade, it's best not to start with the speakers, but conceptually with the type of system. Then discuss products for each room. "Don't show the customer a set of $800 speakers for the master bath until they've settled on the system," says Alan Carmack of Progressive Audio in Cleveland, Ohio. "Why would you pick out granite countertop before the kitchen is drawn?" THB

Building the Infrastructure with Wire and a Panel

Promoted by suppliers and installing companies as the "fourth utility" and "digital plumbing," structured wiring is the building block of the home technology market. In just five short years, the penetration of structured wiring in new single-family housing has climbed from 1 percent in 1996 to more than 42 percent in 2002, according to a joint study by the National Association of Home Builders Research Center (NAHBRC) and CEA. By 2004, penetration is predicted to be more than 50 percent of new homes. Overall, more than three out of every four homebuilders (78 percent) constructed at least one home in 2002 with structured wiring.

Basically, structured wiring consists of three elements: the distribution panel, the cabling and the outlets.

The **distribution panel**, or service center, works like a sophisticated switchboard. Outside services, including cable TV, telephone, DBS satellite and the Internet, enter the panel and are distributed to locations throughout the house. The system is similar to the one used by the electrical breaker panel in the home to control electricity flow.

Certain services like digital cable, digital satellite, high-speed Internet and HDTV require the second part of the wiring system, **high-performance cables**, to allow full access throughout the home. Most systems include RG-6 coaxial cable for TV and video distribution, and Category 5 or better twisted-pair cable for telephone and data. RG-6 coaxial cable provides maximum protection from interference with the TV picture. Cat 5, Cat 5e or even Cat 6 cable provide high-speed access to multiple phone lines without crosstalk. Because the coax and the twisted-pair data and phone cabling are frequently run together to universal, or multi-port, service outlets, they are often bundled, in what is commonly called a composite cable, to simplify installation.

Each room has the third part of the wiring system, **the outlets**, which can be customized to users' specific needs based on which services they want in each room (cable, Internet access, telephone, etc.) Outlets that feature connections for voice, video and data services on a single plate are known as multimedia or universal service outlets. According to the NAHBRC, in 2001 the average newly built single-family home and MDU had approximately seven structured wiring outlets installed.

The distribution panel, like this new OnQ unit with a hinged expansion plate, works like a sophisticated switchboard sending services throughout the house.

Modules and Costs To Look For

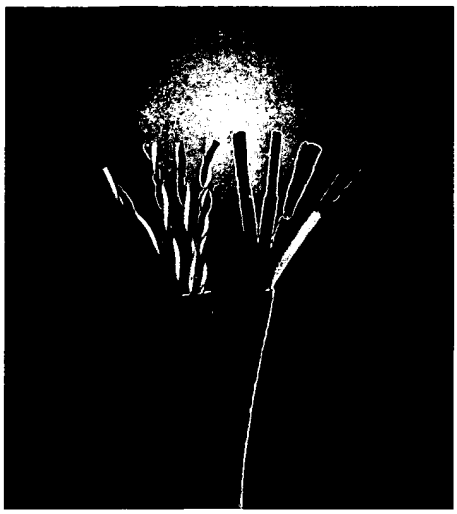
Functionally, there are very few differences among structured wiring systems. When selecting a brand to utilize, builders have to make their evaluation based on delivery, service and the program that the manufacturers wrap around their products. While those companies may call such a solution "structured wiring" in most cases your homebuyers will demand more features for their money, which will require a structured wiring system with greater flexibility.

Manufacturers provide that intelligence in the form of modules that install into the distribution panel. One module, for example, might facilitate a computer network; another might

BUILDER BASICS

- Structured wiring consists of three elements: the distribution panel, cabling and outlets.
- Understand the lingo and know what questions to ask before you start shopping.
- 78 percent of builders included structured wiring in at least one home in 2002.

Source: NAHBRC, CEA



This cable was specifically developed to support whole-house audio applications by Genesis.

distribute digital broadcast satellite (DBS) to various outlet locations. Without these modules, a distribution panel is nothing more than a box into which the wire terminates.

The types of modules and the number of outlets included in a package differ among manufacturers. Some packages might include a cable modem for Internet access; some might distribute video to four locations; still others might reach as many as 12 outlets. Explore the features included in each package to determine the best one for your market.

Not all features that sound great are actually practical. A structured wiring system that comes with a digital subscriber line (DSL) modem, for example, will require that a home have access to DSL service. Also consider whether a package includes additional wiring for security and audio.

With so many options available, it's difficult to pinpoint a cost for a structured wiring system. Generally, the range is from $750 to $2,000, installed, depending on the size of the home. For builders looking for cost-per-square-foot recommendations, installation prices have become highly regionalized, depending on market conditions.

About $1 per square foot (based on the total square footage of the home) seems to a solid guideline for one Cat 5e/RG-6 run. Some builders report paying 50 cents per square foot, but

Know the Lingo

Distribution box

Description: The distribution box is a stand-alone piece of equipment that contains distribution devices for voice, data and video. It must be located in a place that is readily accessible to cabling maintenance.

Benefits: The distribution center allows the wiring system to be customized and updated as technologies are developed. It provides universal access to various networking elements within the home as well as connectivity to service providers.

Star topography

Description: All cables are strung in a star formation that allows all wires to have a direct link from the distribution box to the outlet.

Benefits: The efficient star topography allows system changes to be made without the hassle of having to pull new wires. In addition, services are not disrupted or impaired by other online connected devices.

Universal service outlets

Description: These outlets are designed to support a full range of communication technologies with a variety of flexible configurations, including voice, data and video jacks.

Benefits: Universal outlets allow the homeowner to determine which technologies will be used in each room in the home. Even after wiring system installation is complete, outlets can be changed to meet the homeowner's changing needs.

Recommended wiring

Description: Recommended wiring consists of:
Two CAT 5 cables (CAT 5e preferred);
Two RG-6 quad-shielded coax cables;
One dual CAT 5/dual coax outlet to key rooms in the house, including home office/den/study, kitchen, family/great room, each bedroom, multimedia room, master bathroom, utility room, dining room.

Benefits: Recommended wiring provides for basic and advanced services, including multimedia and interactive communication services. This grade supports both current and developing technologies including multiple communication technology in the home office (multiple computers, fax machines, phone lines, etc.) and extensive home-theater capabilities (DVD, etc.).

Minimum wiring

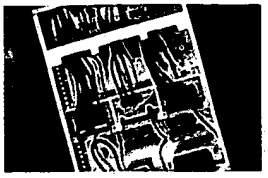
Description: Minimum wiring consists of:
One four-pair UTP Cat 5 cable;
One RG-6 coaxial cable to key rooms in the house, including home office/den/study, kitchen, family/great room, each bedroom.

Benefits: Minimum wiring provides the basic structured wiring required for telephone, satellite, CATV and data services. This allows a homeowner to reap basic benefits such as multiple phone and modem lines and satellite television. Minimum wiring, while technically compatible with current cable modem or DSL broadband services, limits access to many services derived from the broadband pipe.

Upgrade wiring

Description: This wiring is the same as recommended wiring, plus 2-inch PVC piping from the attic to basement to ease installation of additional wiring or fiber optics in the future.

Benefits: Upgrade wiring is a kind of contingency plan to accommodate the unknown future of telecommunication services and technology.



Documentation and testing of wiring is vital using test equipment like this Fluke DSP 4300.

they are usually not getting outlets run throughout the home, but perhaps to only one or two rooms.

Three Levels of Solutions

A consumer educational campaign entitled Wiring America's Homes has established three solutions for structured wiring systems in new homes, based on the industry standard (Telecommunications Industry Association 570-A). The recommended solution provides an infrastructure to support basic and advanced systems, including multimedia and interactive communications services, home-office components and distribution of digital TV signals.

The minimum solution provides an infrastructure to support and integrate basic systems—such as telephone, satellite, CATV and data services—now, while allowing for customization and evolution as new technologies are developed. This solution limits access to many services derived from the broadband pipe (used in the recommended solution). The upgraded solution integrates the recommended solution with added features to allow for easy upgrading of the wiring system. This includes the installation of 2-inch PVC piping from the attic to the basement for ease of installing future wires and/or fiber optic cable, which provides maximum available bandwidth.

Standard Wiring on the Way

The Telecommunications Industry Association's TR 42.2 Committee, responsible for the maintenance and updating of the TIA 570-A Residential Cabling Standard, created three addendums to the standard addressing prewiring for entertainment systems (specifically surround-sound audio for home theater and multiroom audio), control systems (automated lighting, HVAC and whole-house control) and security.

Meanwhile, it is vital that builders create proper documentation for their structured wiring systems. Installers should document the destination, purpose, and cabling type of each run and should label all cables at the distribution device, including those not connected. It is also recommended that each cabling run be tested for continuity (i.e., the run connects the jack to the intended service), length and resistance (i.e., signal loss over distance). For Cat 5 cabling, installers should perform wire mapping to ensure that cables are properly routed and terminated. Field-test instruments are available to assist in this process.

There's no time like the present for builders to integrate structured wiring programs into their construction plans. More applications than ever are going to tie into a home network. The major selling advantage for builders of new homes is the ability to have the cost of the network rolled into a home's mortgage. For a few dollars per month, a homeowner can gain long-term and short-term benefits from a home wiring system.

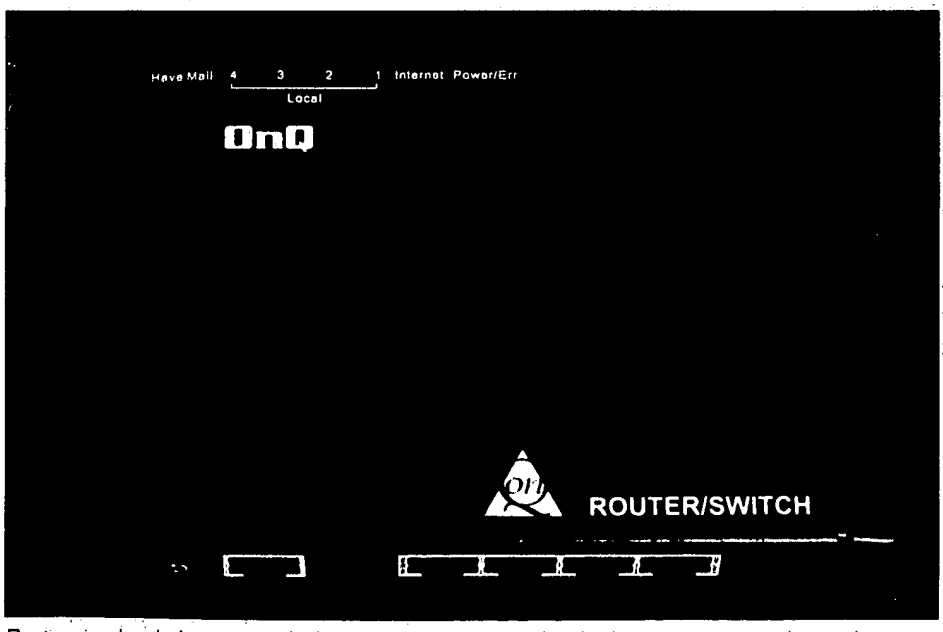
Buyer Demographics

Who is purchasing structured wiring? According to builders, the most likely age group of homeowners are those between the ages of 35 and 44. Not surprisingly, that age group tends to be homeowners with higher incomes and who are not afraid to adopt new technologies. Younger homeowners between 25 to 34 are the next most likely to buy home electronics, followed by Baby Boomers between 45 and 54.

Conversely, very young homeowners (under ager 24) and older persons (over 55) are the least likely to ask for home wiring.

Regarding income levels, wealthier homeowners with household incomes above $200,000 are the target audience. Households earning under $50,000 are longshot buyers.

Among builders themselves 78 percent report installing structured wiring in 2002 as either standard, an option or both. About 22 percent of builders report that they do not install infrastructure wiring. ■



Routers and switches can typically be installed as a module in the customer premise enclosure, or distribution box, to create a gateway or bridge to the Internet.

Planning and Selling Multiroom Sound

Both Baby Boomers still in love with spinning vinyl and Gen Xers enamored with digital music files have soft spots in their hearts for multiroom audio systems.

Consequently, this hot technology is fast becoming a favorite among homebuilders. According to a National Association of Home Builders study, 8.6 percent of new homes in 2002 included multiroom audio compared to just 4 percent in 1996.

In years past, builders defined multiroom or distributed audio as a low-quality, static-filled intercom system for the front door that also just happened to include an AM/FM radio. Years later, many builders define distributed audio as a high-end, expensive audio system suited only for wealthy custom homes. Both definitions miss the mark when speaking about today's high-quality built-in audio systems that come in a variety of price ranges.

The concept is simple: Audio is transferred via wiring throughout the house from one or more source devices (CD player/changer, turntable, MP3 player, tuner, DBS receiver, DVD player, or music storage/management system). Homeowners can access and control more than one source device, and play each one simultaneously in different rooms—without sacrificing the audio quality. The sound emanates from speakers (primarily in-wall or in-ceiling, but free-standing, bookshelf and on-wall speakers work just as well) strategically placed in every room in the house, even the kitchen and bathrooms, or outside on the patio.

Simple in theory, yes, but the task is not as simple as running speaker wire in the walls. In fact using the wrong cabling or technique can adversely effect the quality of the sound; thus, diminishing the overall experience of music in the home.

Whether it's a basic system playing background music, a high-end set-up, or something in between—builders should look to use a specialty low-voltage contractor. Distributed audio is a mainstay product line for most of the approximately 20,000 A/V installation companies in the U.S., thus creating a reliable installation channel upon which builders can rely.

Audio for Everybody, Anywhere, Anytime

The reasons for the surge in popularity of distributed audio systems are simple. From the contractor/builder perspective, these systems are easy to have installed by the home electronics installer. Because the price of the technology has come down significantly, and can now be distributed over Cat 5e as well as 16/4 (audio wire), distributed audio has become a very attractive add-on for the homeowner. If these systems are built into the cost of the home, the add-on is as easy as upgrading from manual windows to power windows in your car, and is easily absorbed in the monthly mortgage payments. Multiroom audio is no longer for the rich and famous.

Even if a builder uses a professional installation contractor, he will be earning mark-up on the equipment and the labor. Most importantly, he will be providing customers with a built-in audio system that they will be satisfied with for years to come.

To help builders and consumers understand multiroom sound, the consumer electronics industry has created the Distributed Audio Alliance. Go to **www.multiroomaudio.org** for more information.

Selling the Benefits

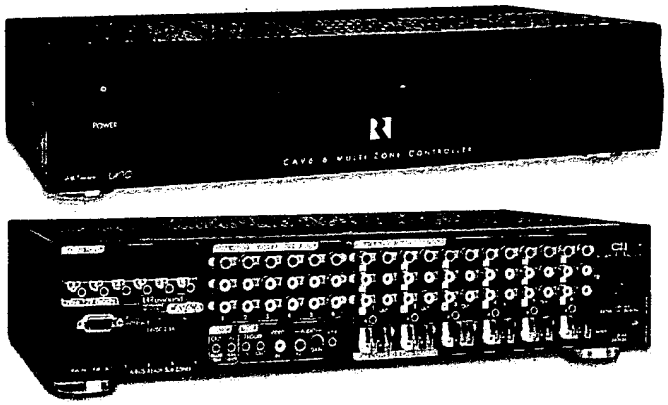
There are clear benefits to multiroom audio. Let's start with the obvious—the cool factor. With distributed audio, a homeowner can barbecue to classic rock on the patio while his wife cooks up her own music selections in the kitchen. Meanwhile their teenage son catches the ballgame in the family room, and their daughter blasts Britney Spears in her bedroom. And the best part is that each family member doesn't need his or her own stereo system—one system gives everyone access to all the music sources.

BUILDER BASICS

- The concept of multiroom audio is simple: Sound is transferred via wiring throughout the house from one or more source devices.
- It is best to plan for a whole-house music distribution system during the pre-construction phase.
- With new developments in technology, the price of built-in audio has come down dramatically. Multiroom audio is no longer for the rich and famous.

The price of this family bliss used to be out of range for many. Within the past couple of years, new innovations such as audio hard drives—which store thousands of songs—MP3 players and CD-mega-changers have become viable music sources for a stereo system. When combined with receivers and amplifiers specifically designed to distribute audio—it creates an easy-to-operate system.

In addition to selling the benefits, as with all built-in technologies, homebuyers can roll the cost of the equipment and installation into their mortgages. With distributed audio, many homeowners take the components with them when they sell the house (except the built-in speakers, volume controls and wiring, of course). So in essence, they have financed an audio system, paid only a portion of the total system cost each month in their mortgage and still end up with a many of the basic components for a system to be placed inside their next home. What a deal!



Russound's CAV6.6 distributes six A/V sources to six zones, with inputs for paging and doorbell functions.

Plan Early and Create Zones

As with most hardwired home control systems that require cabling behind the walls, it is best to plan for a whole-house music distribution system during the pre-construction phase of your new home project or major remodel an existing home. These systems are much more suited for new home construction vs. existing homes where the price tag for the wiring can be at least three times more than if cable installation is done while the walls of the home are exposed.

By the way, did we mention that a Cat 5 structured wiring infrastructure can support the transmission of audio throughout the home? So a builder installing a wiring network to handle phone and Internet distribution has already created the backbone support for a distributed audio system. You may want to rely on your residential systems integrator to suggest the best wiring scenario to distribute audio based on what level of system will suit the budget and style of the new home.

How does a builder know how simple or elaborate a distributed audio system should be? There are a series of questions to ask the homebuying prospect:

- How many locations (both indoor and out) do you want music "piped" to?
- How many people will listen to different music at the same time?
- Is it possible that the family would be happy listening to the same music at the same time?
- Will you listen to the music in the background while you are working around the house or will you be sitting down to specifically listen to the music?
- What kind of controls do you want in each room?
- What is your budget?

Each room or set of rooms can make up a listening "zone," similar to heating and cooling zones of the house. For instance, one zone could be made up of the master bedroom, bathroom and hallway, while you might dedicate a room such as the kitchen to its own zone.

Three Basic Levels of Systems

There are three basic levels of multi-room audio systems:

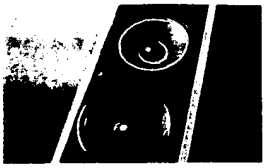
1: Simple: This set-up pipes music from one source to one zone consisting of two or three rooms. These systems typically include a basic receiver and use in-room volume controls and infrared (IR) repeaters for control.

2: Intermediate: This solution delivers a variety of music simultaneously to as many as six zones. Keypads and/or handheld remote controls are commonly used to cue and control the music. This type of system is called a multi-zone, multi-source music distribution system.

3: High-end: Basically, this solution offers the homeowner whatever he wants to listen to, wherever he wants to listen to it. The system might be using many of the same components from the intermediate solution, but this type of multi-source, multi-zone system can go high-end, where virtually an unlimited number of sources can be distributed to virtually an unlimited number of zones. In this premier system, sophisticated touch-panels are often used to control the music.

The price for a "simple solution" system can be sold to homeowners for about

Niles Audio Corp's. new ZR-4630 multi-zone receiver is an example of a distributed audio system that can allow homeowners to listen to several music sources in different rooms throughout a home.



$3,000 (equipment only, not including installation), or about $500 per room. The simplest solution, which is not to be confused with an intercom, is a stereo receiver with two pairs of speaker outputs. Each output serves a separate room, or you can add a speaker selector box that includes volume control.

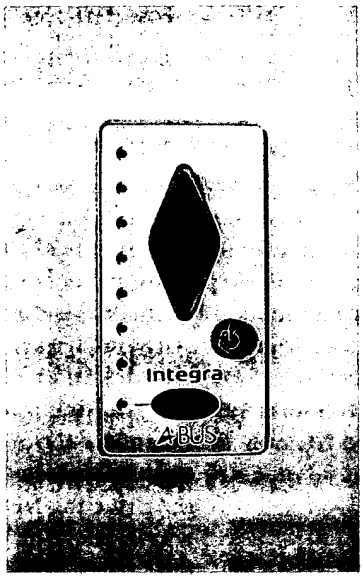
For retrofits, there are systems on the market that integrate with a home's existing phone network and include an audio amplifier with built-in multi-function intercom and IR repeater, a radio-frequency (RF) distribution amplifier and a telephone punch-down block, in addition to speakers and volume controls, of course.

A convenient addition to a starter system is an (IR) repeater. An IR repeater extends the reach of any existing handheld remote control, enabling users to set the music from almost any room of the house. Finally, the system needs in-wall or in-ceiling speakers, which can range from $60 per pair to $300 per pair.

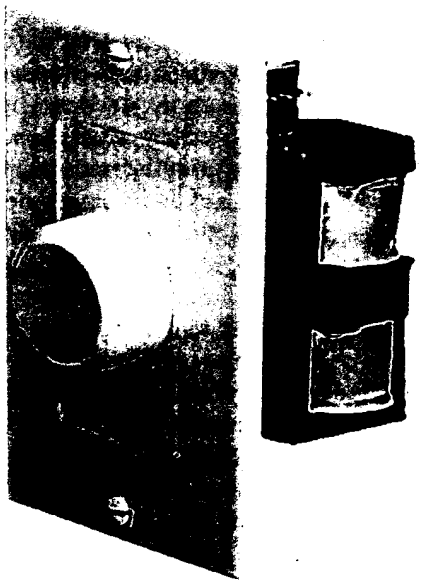
Creating an Intermediate System

For about $6,000 (end-user cost, again equipment only), or about $750 per room, builders can offer homeowners a system that lets them access the family room CD player while working in the library, while the wife tunes to a DBS station from the kitchen. An intermediate-grade multizone, multisource audio system consisting of a preamplifier/receiver, keypad-style controls and IR repeaters serves anywhere from four to six zones. Upgrading to better speakers and/or adding weatherproof speakers outside in the yard are other options to consider.

Integral to this type of music distribution system is a multizone preamplifier/receiver. This component includes the switches, routers and amplifiers necessary to distribute multiple sources of music to several sets of speakers located throughout the house. Consider it the brains of the music system. The simplest type is a two-zone receiver that feeds music to two distinct listening areas. Some systems can shuttle four sources to four zones and are generally used for a home up to 2,500 square feet. More advanced multi-zone units can deliver



Intermediate audio distribution systems might also include in-wall controls, like the AKN-1 from Integra (above) and Channel Vision's ARIA (below).



six sources to six zones—a good size for a 3,000-square-foot home.

In addition to the zones they serve, multizone preamps also differ in the number of music sources they can support. A multizone preamp with four inputs, for example, can distribute music from four sources to a pair of speakers in each room.

A multichannel amplifier is another essential part of a music distribution system. It holds several independent amplifiers in one box. This attaches to the multizone preamp, and together, they sit inside the equipment cabinet with the rest of the stereo gear. Each of the internal amplifiers is dedicated to a listening zone. Amplifiers also differ in their power output. How loudly a homeowner likes to listen to music, the size of each zone and the distance from the preamp to the speakers all determine the best amplifier size to suit the home's needs.

This is also the system level at which a homeowner might want to add a more sophisticated control device, such as an in-wall keypad in each zone. From such a device, the user can select the type of music (DVD, CD, DSS station, radio station, etc.) as well as adjust the volume. Each music zone requires its own device to cue and control music sources remotely.

Speakers should be selected based on the homeowner's listening preferences and frequency of use. For example, the main listening areas such as the living room, den, kitchen, master bed/bath room, patio and other outdoor areas deserve high-quality speakers. Secondary listening areas like the laundry room and guest rooms might be well served by less expensive speakers.

Creating a High-End System

Primarily for custom builders, a premier audio distribution system can be costly, but will carry the best multi-source/multi-zone controllers that can handle just about any number of music sources and any number of music zones.

System prices start at $6,000 or about $1,250 per room (since a homeowner can spend as much as $25,000 on a pair of in-wall speakers, there is no limit to what can be spent). ■

Distributed Audio Alliance

A-BUS	OnQ Technologies
Bose	Polk Audio
Channel Vision	Russound
EH Publishing	Sonance
Elan Homes Systems	SpeakerCraft
Niles Audio	Yamaha
Onkyo	

These 13 companies have forged a new alliance to promote the benefits of multi-room audio to consumers and builders.